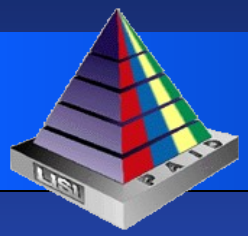
LISI

A Maturity Model and Interactive Process for Assessing and Improving Interoperability

June 2000

Levels of Information Systems



Agenda

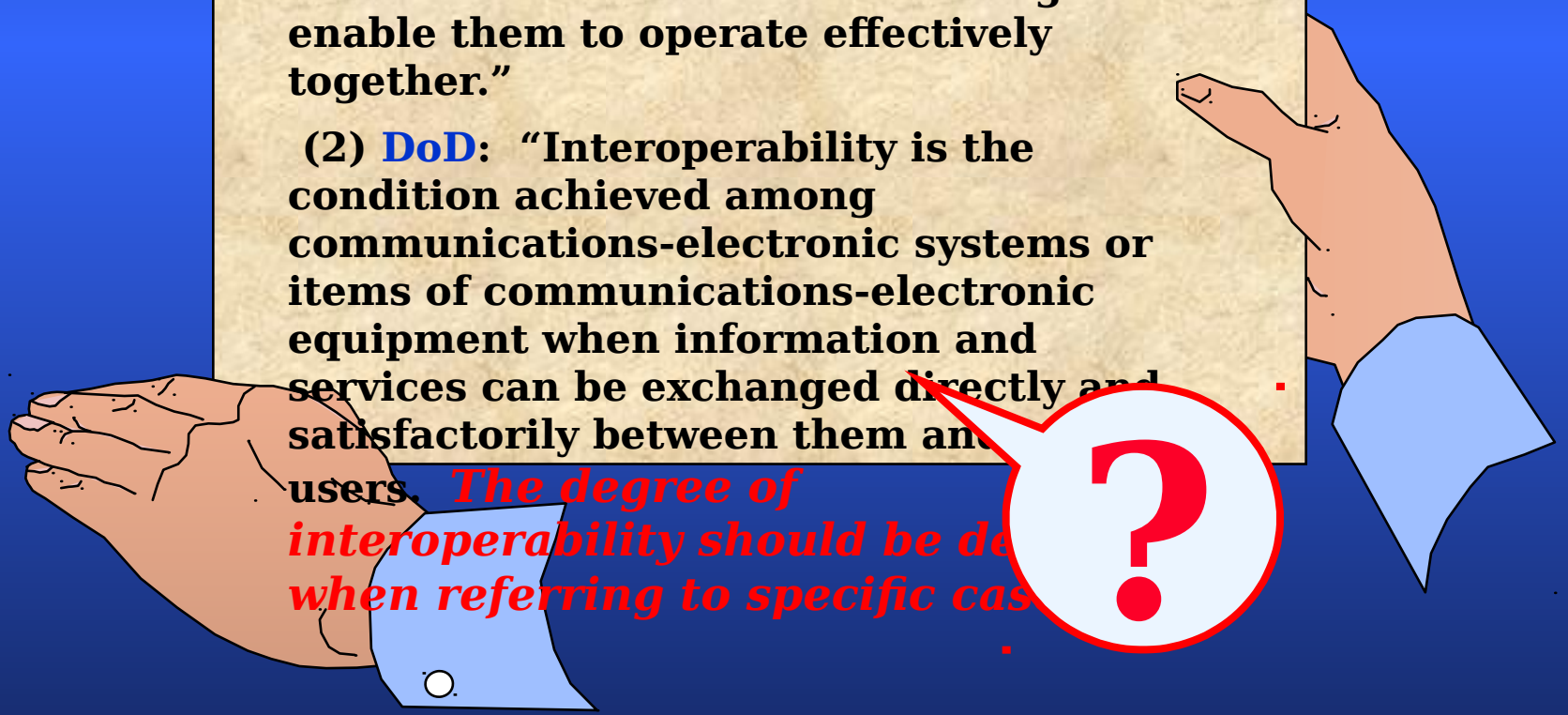
- LISI Overview
  - Context
  - Model and Process
  - Relationships to other initiatives
- Example LISI Assessments
- “Inspector” Tool
- Next Steps

"Interoperability" is Vaguely Defined

For example, in the DoD world ... JCS Publication 1-02

(1) **DoD, NATO**: "Interoperability is the ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces, and to use the services so exchanged to enable them to operate effectively together."

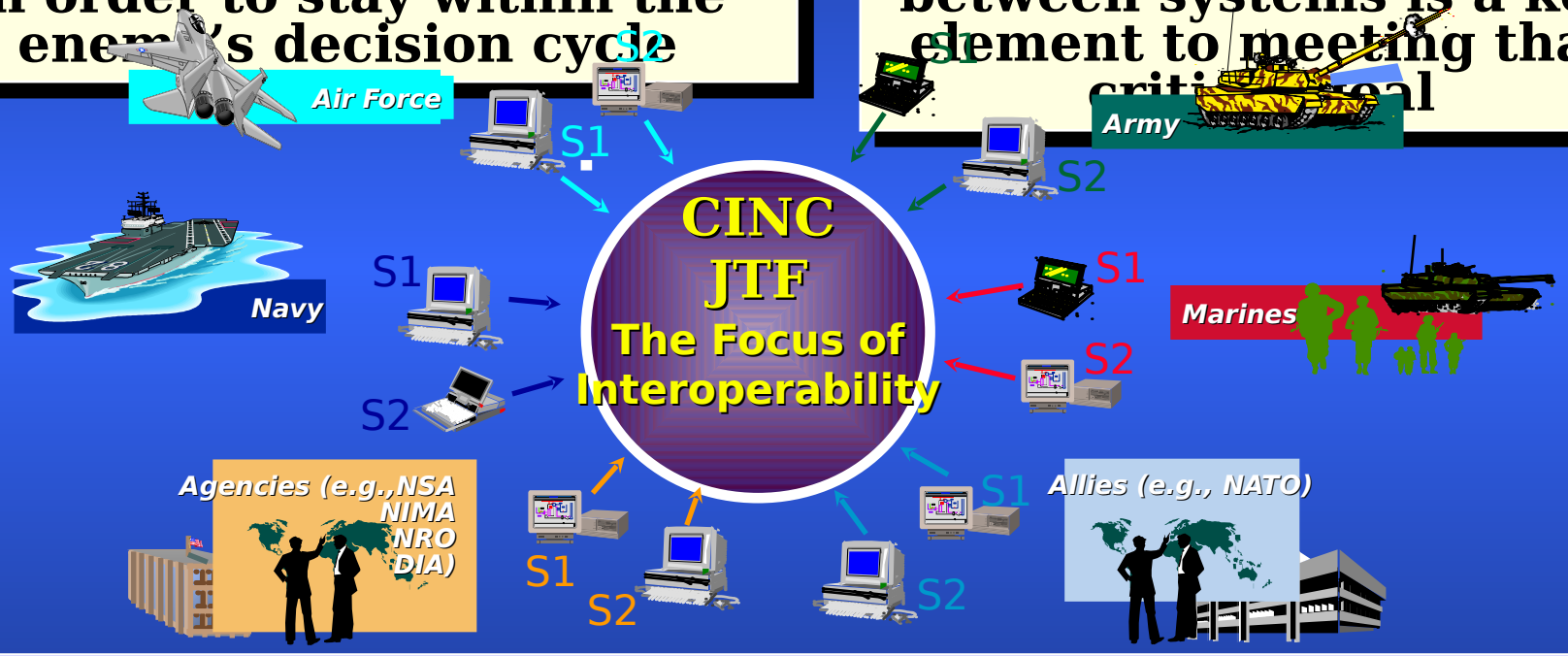
(2) **DoD**: "Interoperability is the condition achieved among communications-electronic systems or items of communications-electronic equipment when information and services can be exchanged directly and satisfactorily between them and/or users. *The degree of interoperability should be defined when referring to specific cases.*"



LISI Brings DoD Players Together

The Commander needs the right information, within a small window of opportunity, in order to stay within the enemy's decision cycle

Understanding the *"levels"* of interoperability required between systems is a key element to meeting that critical

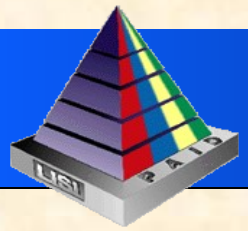


LISI articulates the distinctions between various "levels" of interaction

LISI drives improvements and new acquisitions systematically

by use of a maturity model and a collaborative process

LISI provides an unambiguous performance measure



Interoperability Needed for Mission Success

Operational Interoperability – Assessments of the relative importance and performance of each organization with respect to mission effectiveness

- What is the organization's role in the mission's critical path?
- To what extent do the organization's (readiness, training, systems, etc.) interoperability deficiencies impact mission performance (e.g., getting weapons on target)?

System Interoperability - Assessments of each system's capabilities (existing or planned) with respect to its information exchange requirements (a validated or conjectured level of interactions needed to perform the operational missions)

- Does the CINC communications infrastructure provide sufficient bandwidth to support collaborative targeting?
- Do systems interoperate at a level of sophistication sufficient to support deep interdiction?
- Are the implementation of tactical data links engineered in a way to ensure that the mission requirements can be accomplished?

The Scope of Mission Based Interoperability

Operator

System

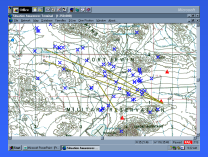
Data Link

Box-to-Box

Operator FAC

Knowledge

Display



Display Symbology

Information

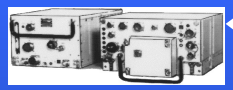
Host TACP

System Host

Data

Terminal (JTIDS)

Terminal (MIDS)



010110

RF

010110

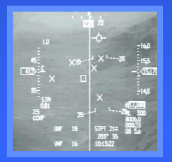
Host (F-16C)

System Host

Data

Protocol

Display (DDI)



Display Symbology

Information

Operator Pilot

Knowledge

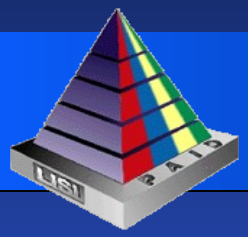
User-system Interface (USI)

Warfighter to Warfighter

Legend: Technical IO Procedural IO Operational IO

Slide Courtesy of Capt DJ Johnson, USAF

Phases of LISI's Development



Intelligence Systems Council

USDA&T C4ISR Integration Task Force

ACC Architecture Working Group Interoperability Panel

Pilot Assessments of LISI Prototype

Desert Storm 1991

Exploratory Phase → **Analysis Phase** → **Proof of Concept Phase** → **Application & Evaluation Phase**

Initial Operational Capability (IOC 2000)

1994 | 1995-1996 | 1997-1998 | 1999-2000

Birth of Concept

DoD Endorsement

Architecture Framework Integration

Pilot Assessments

- DoD
- Intelligence Community
- Other Federal Government

FY00 LISI Consortium Participants

PARTICIPATING

- ESC CIPO — IOC for Tool & Pilot Assessments
- MARCORSYSCOM — Extend FY99 Integration w/MSTAR
- BMDO — Examine weapon system interoperability
- Intel CIO (w/CIA AAT) — Collaboration Tool Assessments
- Coast Guard — Assist w/Deep Water Project
- DISA/J6/J8 — 3-month Trial assessment of incoming ORDs
- Federal CIOs — Pilot assessment w/non-DoD Agencies
- NIMA — Mapping Assessment Criteria
- UCAO — Analysis of Common Operating Environments

PENDING STARTUP

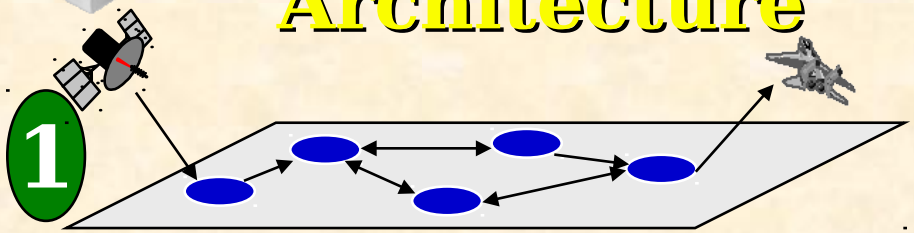
- TSPO (NSA) — Secure Communications Analysis

STRONG INTEREST

- Army Sys. Eng. Office (Interop WG) — Continued support to HTIO
- Army Digitization Off. — Pilot Assessment of 20-30 systems

The LISI Model &
Process

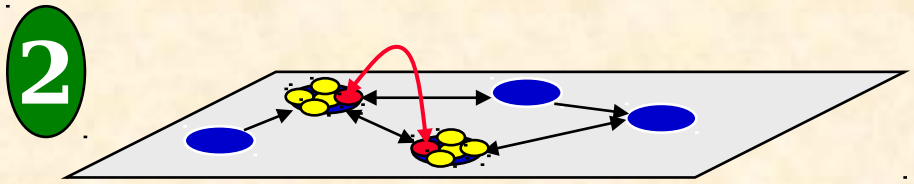
Stages to Constructing an Architecture



OPFAC Centric Analysis
(e.g., Sensor to Shooter Interoperability Analysis)

Which nodes must participate (i.e., organizations and platforms required) to conduct the mission?

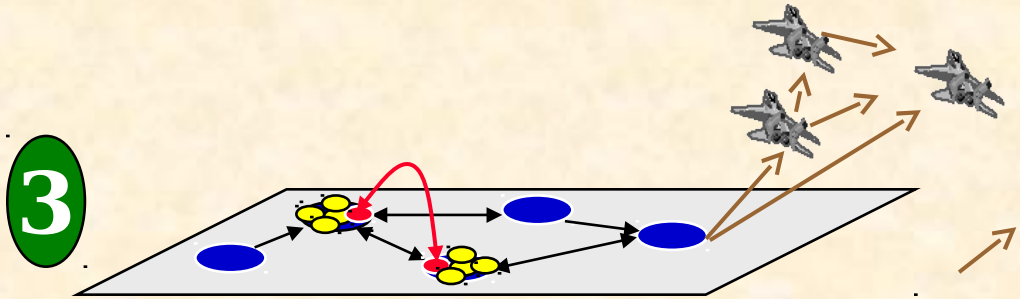
What information (i.e., operational IERs needed to conduct the mission) must flow between the nodes to complete the mission?



IT System Centric Analysis
(e.g., Level of Interoperability Required between Systems)

Which IT systems (i.e., C4ISR automation technology) will be used to conduct the exchange to meet mission requirements?

Which specific system capabilities (i.e., data formats and protocols to meet IERs) will be used to conduct the exchange between IT systems?



Tactical Data Centric Analysis
(e.g., Tactical Data Exchange Implementation Analysis)

How should information be implemented by IT systems (i.e., data/mission engineering) to most effectively conduct the mission?

What standards & engineering criteria must be followed (i.e., operational criteria to meet IERs) when implementing IT systems?

Architecture-based Analysis

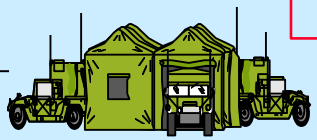
Mission: Targeting

Operational

USMTF A659 (ATO)

AOC

JIER
Air Tasking Order



CTOC

IER
Data Entry

Operational view shows OPFACs and IERs for all missions

Systems

Technical

Message Formats

Applications

Mapping

Data

USMTF
TADIL
VMF...

Collaboration

Imagery

Office Automation Products

Infrastructure Protocols

Architecture-based Analysis

Mission: Targeting

Operational

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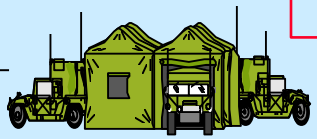

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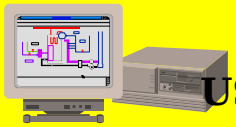
Operational view shows OPFACs and IERs for all missions

Systems



TBMCS

ICD
USMTF Msg Exchange

AFATDS

USMTF A659 (ATO)

System
Survey

Systems view overlays system deployments that support mission

Message Formats

Applications

Mapping

Data

USMTF
TADIL
VMF...

Collaboration

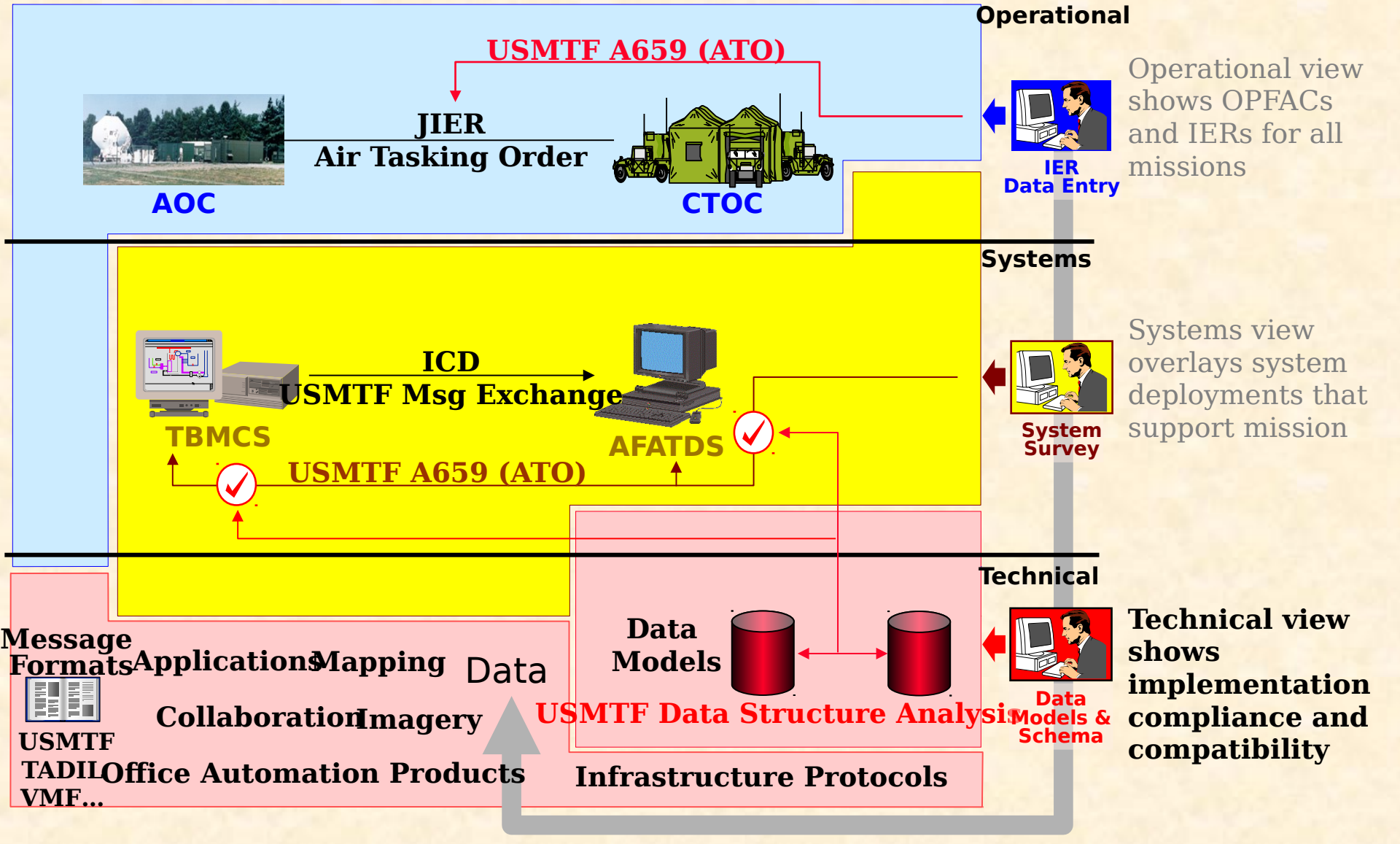
Imagery

Office Automation Products

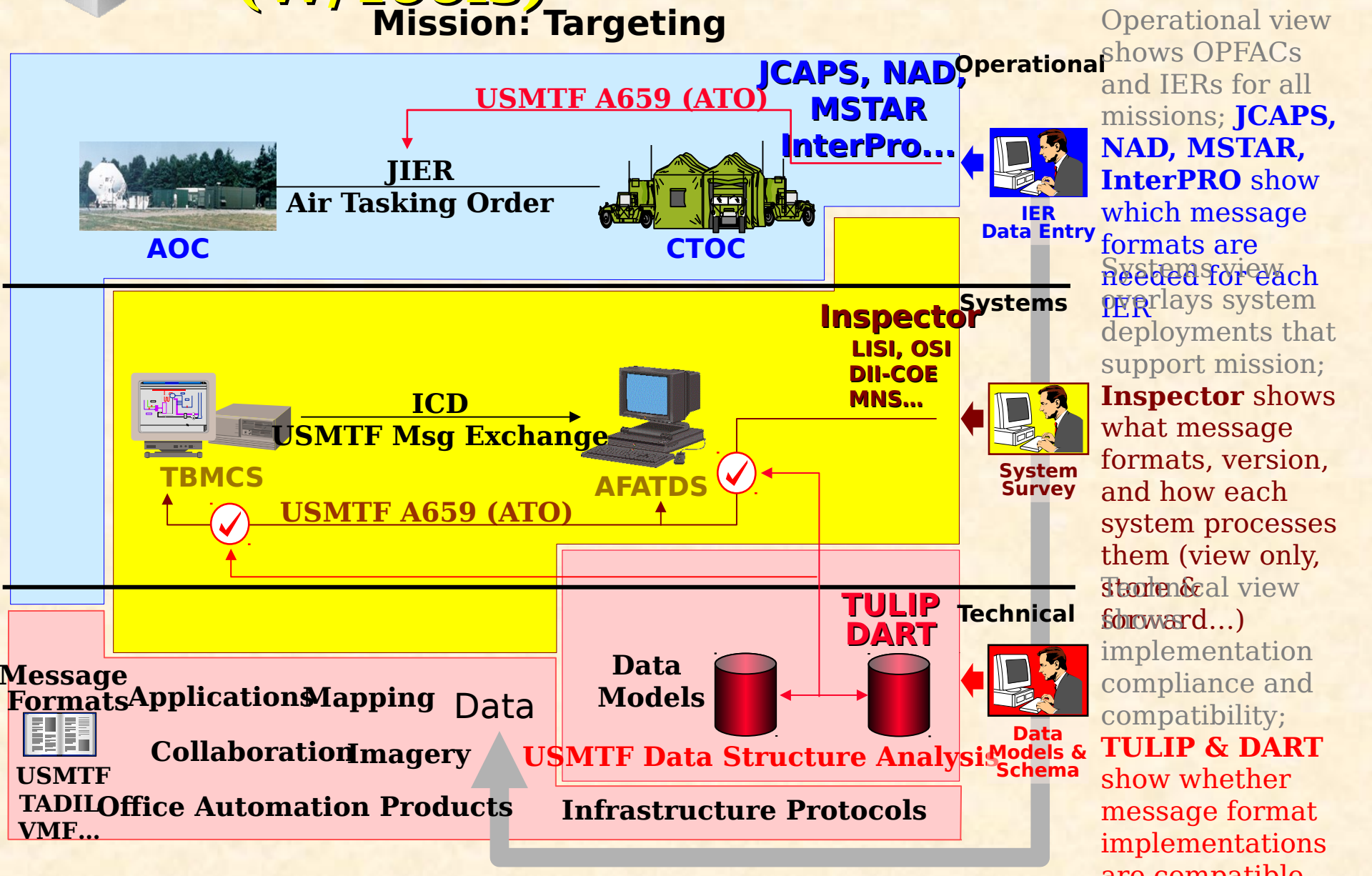
Infrastructure Protocols

Architecture-based Analysis

Mission: Targeting



Architecture-based Analysis (W/Tools)

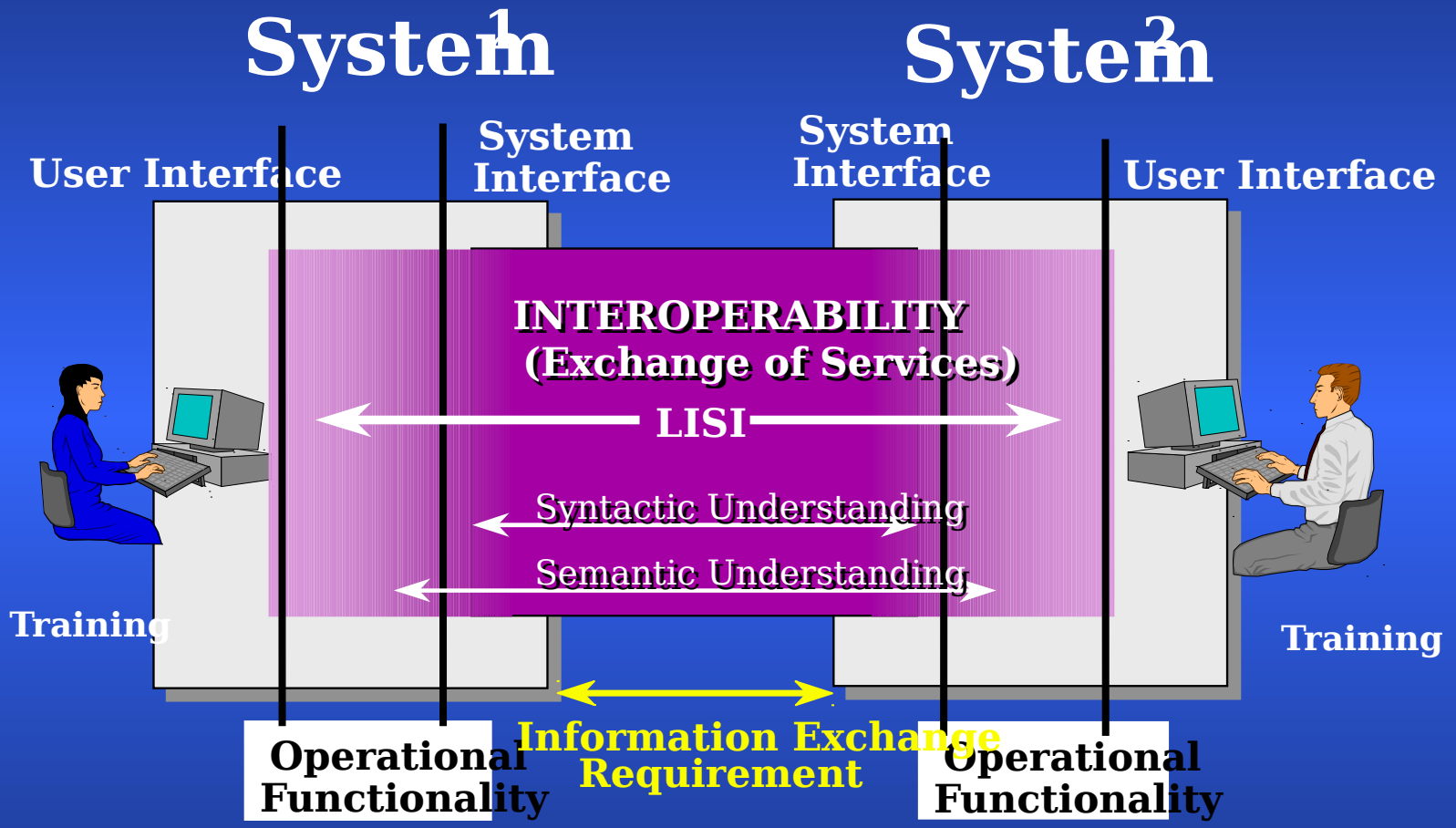


Operational view shows OPFACs and IERs for all missions; **JCAPS, NAD, MSTAR, InterPRO** show which message formats are needed for each IER

Systems view overlays system deployments that support mission; **Inspector** shows what message formats, version, and how each system processes them (view only, store & forward…)

Technical view shows implementation compliance and compatibility; **TULIP & DART** show whether message format implementations are compatible

Focus of LISI Analysis



LISI assesses the level of interoperability attained *between systems* (not between users and the systems)

The LISI Interoperability Maturity Model

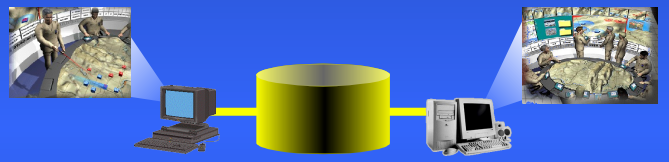
provides a common basis for requirements definition and for incremental system improvements

Cross-domain information & applications sharing
Advanced collaboration
(Event-triggered global database update)

4
Enterprise
Interactive manipulation
Shared data and applications

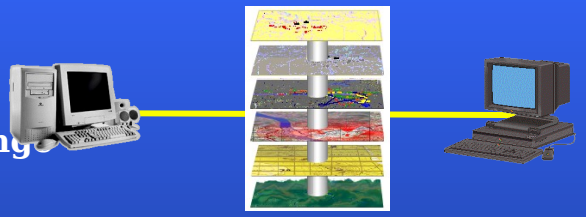
Shared databases
Sophisticated collaboration
(Common Operational Picture)

3
Domain
Shared data
"Separate" applications



Heterogeneous product exchange
Basic collaboration
(Annotated imagery, maps w/ overlays)

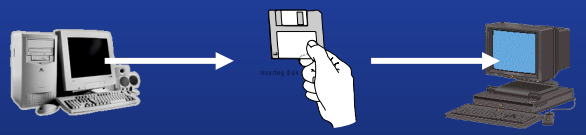
2
Functional
Common functions; complex exchang
Separate data and applications



Homogeneous product exchange
(FM voice, tactical data links, text files, messages, e-mail)
Manual Gateway
(diskette, tape, hard copy exchange)

1
Connected
Electronic connection
Simple file exchange

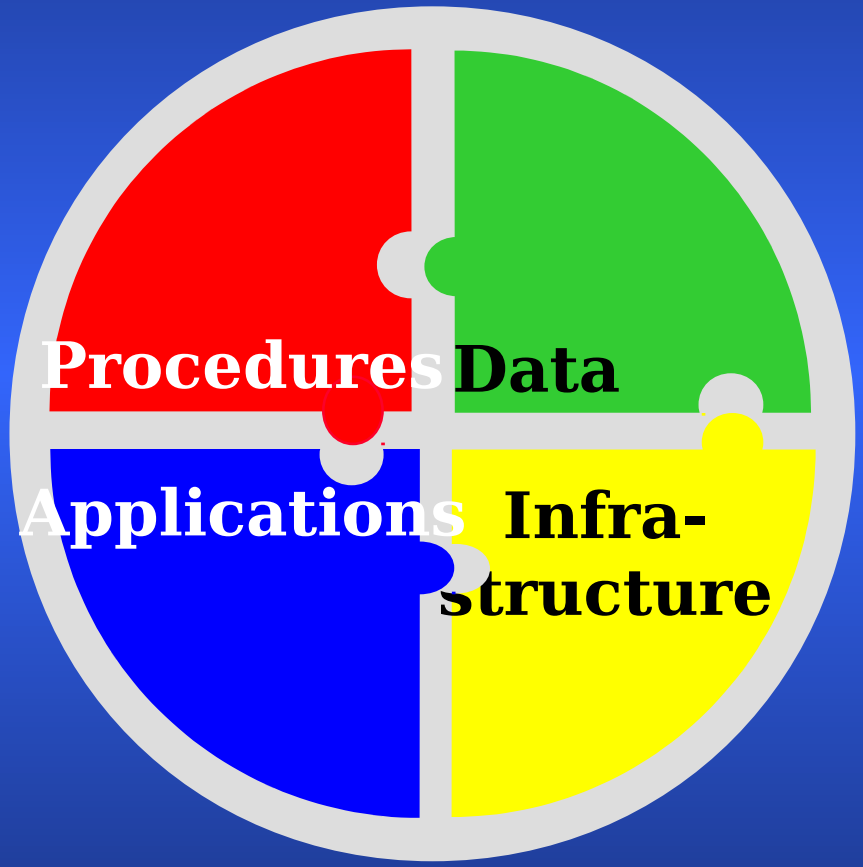
0
Isolated
No Digital Connection



The LISI "PAID" Paradigm

defines the interoperability attributes of information systems

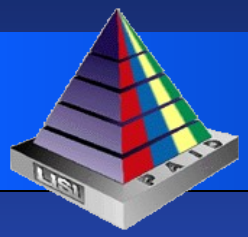
What policies and procedures enable systems to exchange information, capabilities, and services?



What information formats, data protocols, or databases enable the exchange of data and information?

What set of applications enable information exchange, processing, or manipulation?

What environment (hardware, communications and networks, system services, and security) enables system interaction?



The LISI Capabilities Model

identifies the capabilities and the implementation options available for achieving each level of interoperability

LEVEL (Environment)			Interoperability Attributes P	A	I	D
Enterprise Level (Universal)	4	c	Multi-National Enterprises	Interactive (cross applications)	Multi-Dimensional Topologies	Cross-Enterprise Models
		b	Cross Government Enterprise			
		a	Govt Enterprise	Full Object Cut & Paste		Enterprise Model
Domain Level (Integrated)	3	c	Domain Organization-wide Doctrine, Procedures, Training, etc.	Shared Data (e.g., Situation Displays Direct DB Exchanges)	WAN	DBMS
		b		Group Collaboration (e.g.,White Boards, VTC)		Domain Models
		a		Full Text Cut & Paste		
Functional Level (Distributed)	2	c	Common Operating Environment	Web Browser	LAN	Program Models & Advanced Data Formats
		b		Basic Operations Documents Briefings Pictures & Maps Spreadsheets Databases		
		a	Program Standard Procedures, Training, etc.	Adv. Messaging Message Parsers E-Mail w/Attachments	NET	
Connected Level (Peer-to-Peer)	1	d	Standards Compliant	Basic Messaging (e.g.,Unformatted Text, E-mail w/o attachments)	Two Way	Basic Data Formats
		c		Data File Transfer		
		b	Security Profile	Simple Interaction (e.g., Telemetry, Remote Access Text Chatter, Voice, Fax)		
		a			One Way	
Isolated Level (Manual)	0	d	Media Exchange Procedures	N/A	Removable Media	Media Formats
		c	Collocated systems, Single operator		Manual Re-entry	Private Data
		b	Collocated systems, Separate operators			
		a	Non-collocated systems, Exchange via Operators			
		o	NO KNOWN INTEROPERABILITY			

WAN

SIPRNET
JWICS
NIPRNET
(Internet)
DISN LES
VSAT
DISN

Example Implementation Options

Services

Databases
Imagery
Graphics
Mapping
Spreadsheet
Clipboard
Word Processing

Mapping

Chart
ARC INFO
ARCVIEW
ATLAS
CMTK
Dew Drop
Delorme
Edge
Hipparchus
Imagine
JMTK
MPEG Viewer
MUSE
Navig. Spheroids
OILSTOCK
Open Map
Raindrop
Spatial X
QT
TEM

Document Formats

.asc .txt
.aw .doc
.lwp .pdf
.rtf .wpx
.OR2 .OR3
.nsf .htm
.sgm XML

Standards

DoD JTA
IC
ANSI
ISO
IEEE

The LISI Assessment Process

An Interactive Means to Measure and Improve Interoperability

Requisite System Capabilities

LEVEL (Environment)		Interoperability Attributes P	A	I	D
Enterprise Level (Universal)	4c	Multi-National Enterprises	Interactive (cross applications)	Multi-Dimensional Topologies	Cross Enterprise Models
	4b	Cross Government Enterprise			
	4a	Govt Enterprise	Full Object Cut & Paste		Enterprise Model
Domain Level (Integrated)	3c	Domain Organization-wide Doctrine, Procedures, Training, etc.	Shared Data (e.g., Situation Displays Direct DB Exchanges)	WAN	DBMS
	3b		Group Collaboration (e.g., White Boards, VTC)		Domain Models
	3a		Full Text Cut & Paste		
Functional Level	2c	Common Operating Environment	Web Browser	LAN	Program Models & Advanced Data
	2b		Basic Operations Documents Briefings Pictures & Maps Spreadsheets Databases		
	2a	Program	Adv. Messaging		

Implementation Options

WAN
SIPRNET
JWICS
NIPRNET (Internet)
DISN LES
VSAT
DISN

Services
Databases
Imagery
Graphics
Mapping
Spreadsheet
Clipboard
Word Processing

Mapping
Chart
ARC INFO
ARCVIEW
ATLAS
CMTK
Dew Drop
Delorme
Edge
Hipparchus
Imagine
JMTK
MPEG Viewer
MUSE
Navig. Spheroids
OILSTOCK
Open Map
Raindrop
Spatial X
QT
TEM

Tool-Facilitated System Registration & Assessment

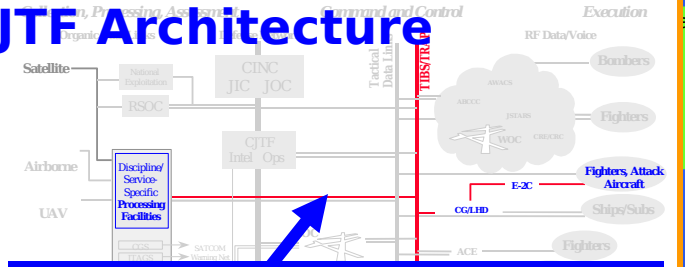
System Profile

System Developers

Shortfall

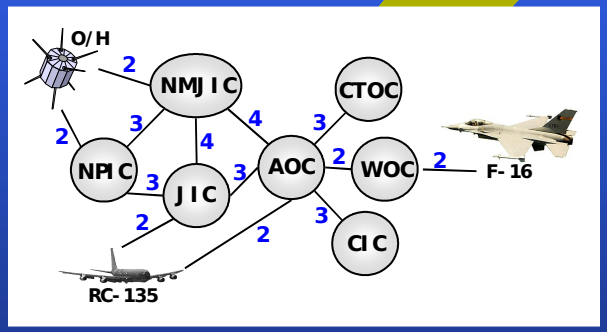
Levels Achievable Between Systems

JTF Architecture

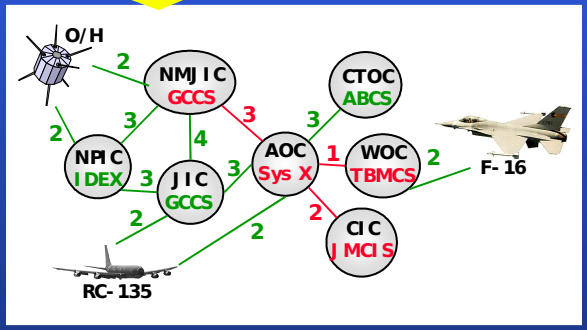


Target Folder Exchange Requirement (Heterogeneous Products, Shared Data)
- Level 2a if non-collaborative
- Level 3c if collaborative interplay

CINC & JTF Operations Planners



CINC Targeting Ops.
Required Levels of Interoperability



CINC Targeting Systems
Current Levels of

Relationships
to Other Constructs

LISI "Maps" Current Interoperability Rule Sets to the Levels

JTA
COE
NATO Architectures
SHADE

MISSI
SSI
Intelink
DMS

....

Current Guidance

Consistency & Reality Checks

LISI Level

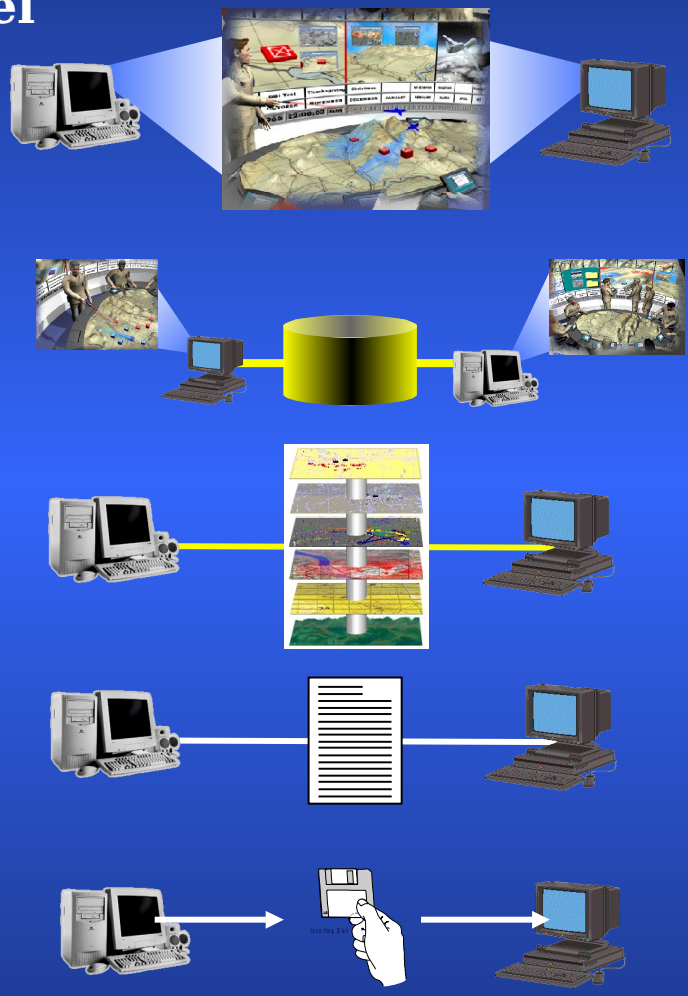
4

3

2

1

0

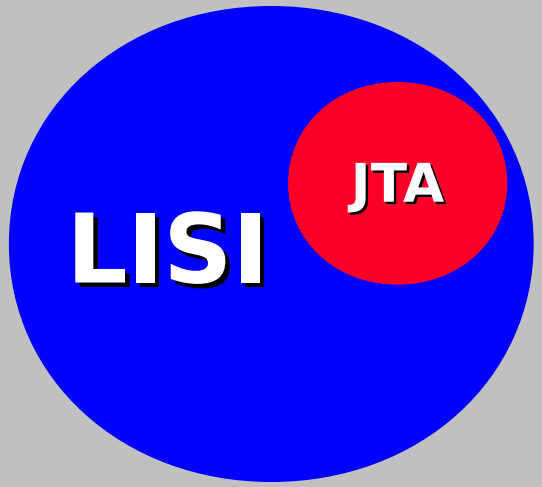


What aspects and elements of each guidance document are related to achieving the desired level of interoperability?

LISI - JTA Relationship

JTA Component	Function (JTA Reference)	JTA Paragraph	Description (Capabilities)	Technical Profile	LISI Attribute (PAID)	LISI Level	LISI Question
HCI	User Interface Services	2.2.2.1.2	Window Environment - CDE version 1.0 based on X Window and OSF Motif **AND**	FIPS 158-1	I	2b	
			Window Environment - CDE version 1.0 based on X Window and OSF Motif **AND**	OSF Motif AES, Release 1.2	I	2b	
Data Management Services - 2.2.2.1.3	Data Manag Services						
Data Interchange Services - 2.2.2.1.4	Document I						

100% of the JTA Standards Map Directly into the LISI Levels



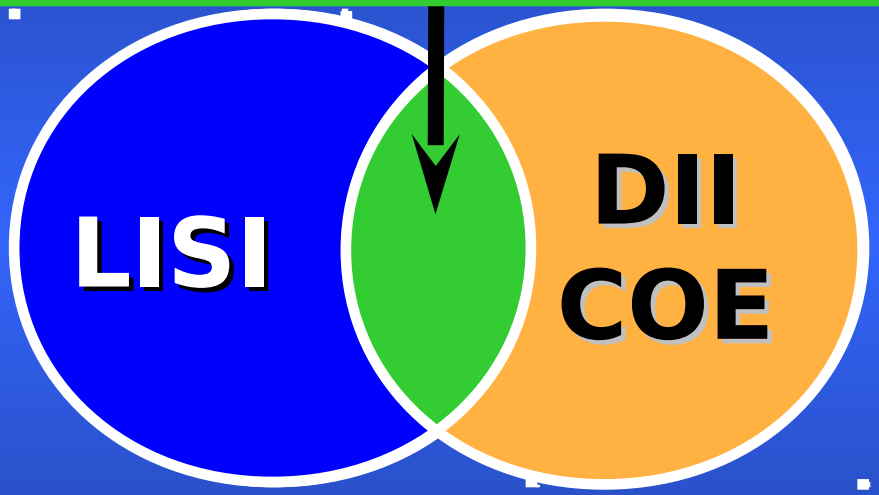
Non-JTA Examples:
- Capabilities not covered by
- Weapon Systems/Standards
- Mission-Specific Applicatior

JTA/LISI Examples:
- Window Environment
- Database Language
- Document Interchange Formats
- Security Protocols

LISI - DII COE Relationship

20% of the COE Integration & Runtime Environment Standards (I&RTS) questions map directly into the LISI levels

LISI Focus: ***Interoperability*** **assessed in terms of system-to-system interactions**



DII COE Focus: **Software** ***portability*** **and application-to-operating environment interactions**

Non COE Examples:

- Any JTA Items Not Used by C
- Non-DoD System Implement
- Mission Applications
- System-to-System Relationsl
- Non-DoD Weapon Systems, .

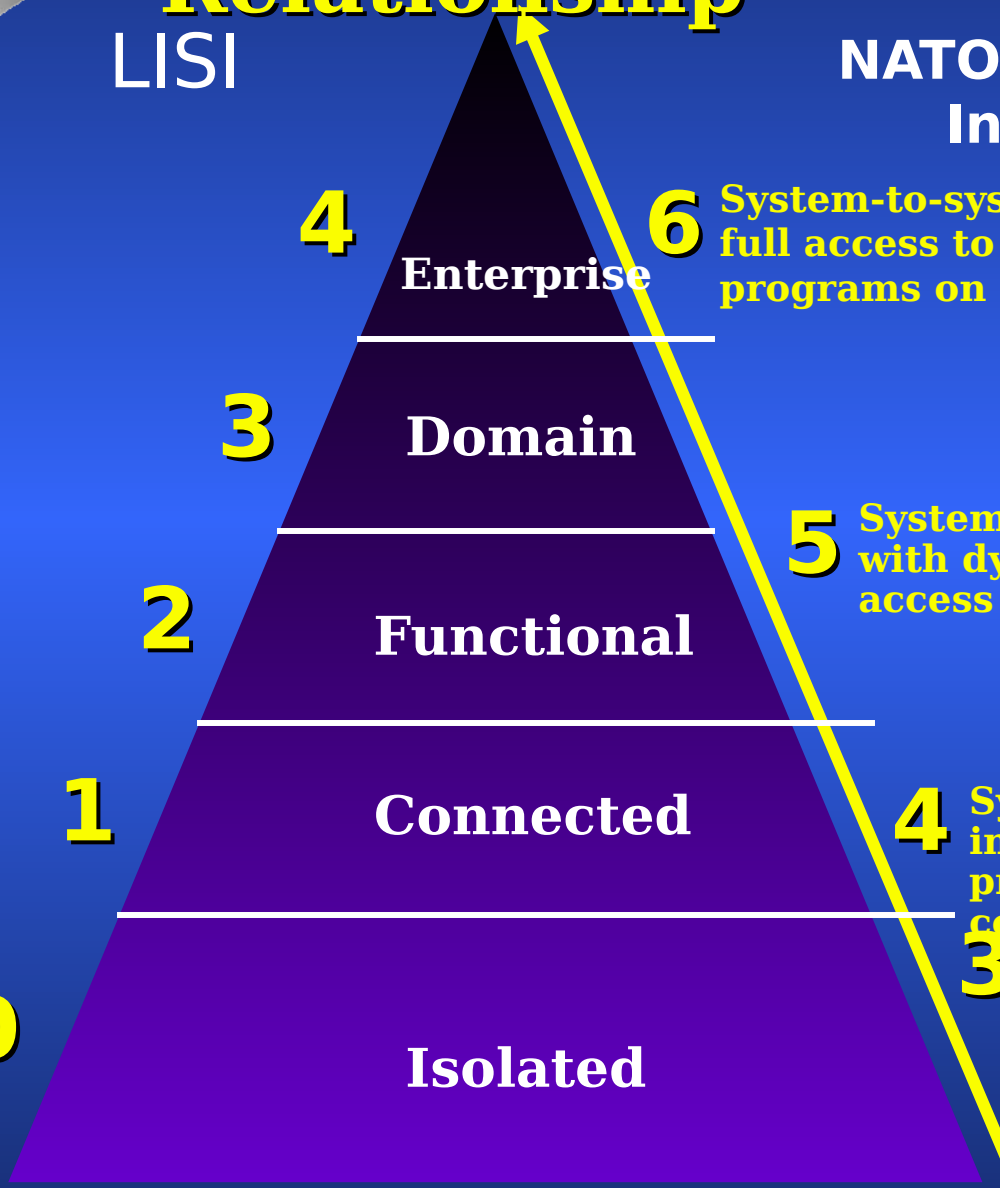
COE/LISI Examples:

- Infrastructure Implementations (TCP/IP, DCE, SLIP, ...)
- Applications: FTP
- Security Issues
- Naming Conventions (Files)

LISI Examples:

- ability Issues
- figuration Management
- umentation Requireme
- ing of COE
- em Recovery Issues

LISI - NATO Levels Relationship



NATO Levels of System Interconnection

6 System-to-system interconnectivity, full access to all information & programs on either system.

5 System-to-system interconnectivity with dynamically controlled data access constraints.

4 System-to-system interconnectivity, predetermined physical constraints.

3 Collocated systems, single operator

2 Collocated systems, separate operators

1 Non-collocated systems, independent subsystem for exchange between operators

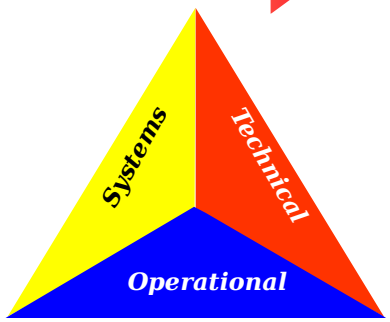
LISI Provides the Audit Trail that Links System Capabilities to Impact on Business & Mission Effectiveness

C4ISR Architecture Working Group (AWG)

C4ISR Architecture Framework Version 2.0

What system capabilities are needed to perform the required level of information exchange?

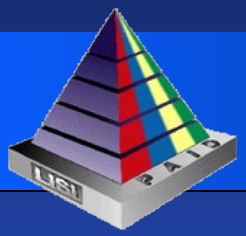
What technical criteria must the capabilities meet?

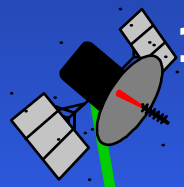


What levels of information exchanges are required to support mission operations?

For example, the Architecture Framework that DoD and other IC & Federal agencies are using incorporates LISI into

Architecture Node Connectivity Diagram Produced by LISI for Assessing Interoperability





NSA ELINT

1a

CTAPS

3a

CIS

2c

Weapon

AFMSS

2a

MIDB

2c

2c

EOB Server

2a

JMCIS

3a

RAAP

1d

ALE

2b

ASAS

2a

CATIS/IESS

2a

GCCS

The use of colored lines helps to draw attention to where the gaps or shortfalls for interoperability exist!

For illustration only

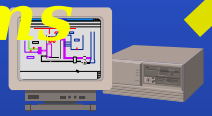
Example LISI
Assessments

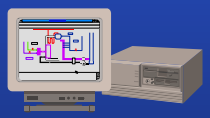
Types of LISI Assessments

LISI Assessment of a Single System

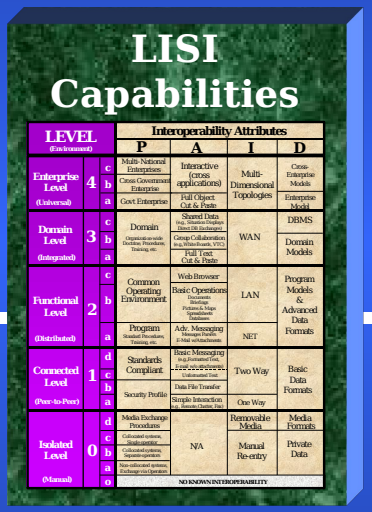
COMPASS Example

LISI Assessment of Two or More Systems





JBC MIS Experiment
ISBA Experiment



Sufficiency

Are the capabilities for the requisite level present across PAID?

Conformance

Are the existing capabilities compliant with criteria that govern Enterprise implementations?

Sufficiency

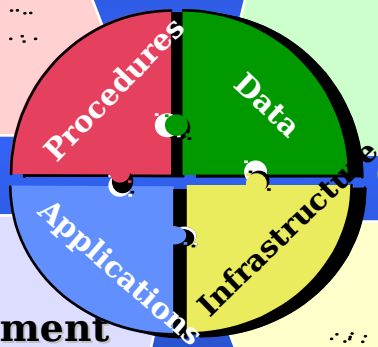
Are the requisite PAID capabilities in both systems?

Interoperability

Are the existing capabilities interoperable with each other? (e.g., common products, common standards

COMPASS Attributes in Terms of PAID

- **Procedures**
  - COE Level 5
  - Custom implementations
- **Data**
  - DIS PDUs
  - COMPASS messages
  - VAT Audio
  - JFIF Images
  - NV video
  - Map Formats (e.g., JMTK)



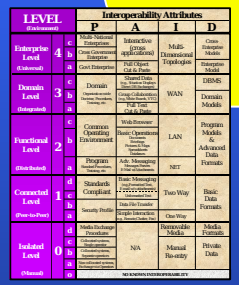
- **Applications**
  - Session Management
  - Shared Overlay Management
  - Composite Mission Preview
  - Simulation Mission Rehearsal
  - Whiteboard -- ShowMe
  - Teleconferencing -- NV/VAT
- **Infrastructure**
  - IP WAN
  - TCP/IP
  - Video camera
  - Ethernet
  - IP multicast
  - Removable media

Single System Assessment - COMPASS

COMPASS System Interoperability Profile - Sep 97

COMPASS Attributes

LEVEL			Interoperability Attributes P	A	I	D
Enterprise	4	c				
		b				
		a				
Domain	3	c		ShowMe	IP WAN	
		b		NV/VAT	Video Camera	DIS PDUs
		a		Cut & Past	IP	
Functional	2	c	COE Level 5	GAP !	TCP/IP	VAT audio
		b				NV video
		a		Solaris Operating System	Ethernet	COMPASS Messages
Connected	1	d	PROBLEM!			Map Formats
		c				
		b	Non-Standards Compliance	X Windows		JFIF Images
		a				
Isolated	0	d				
		c				
		b				
		a				
		o	NO KNOWN INTEROPERABILITY			



LISI Capabilities Model

Maturing the COMPASS Capability

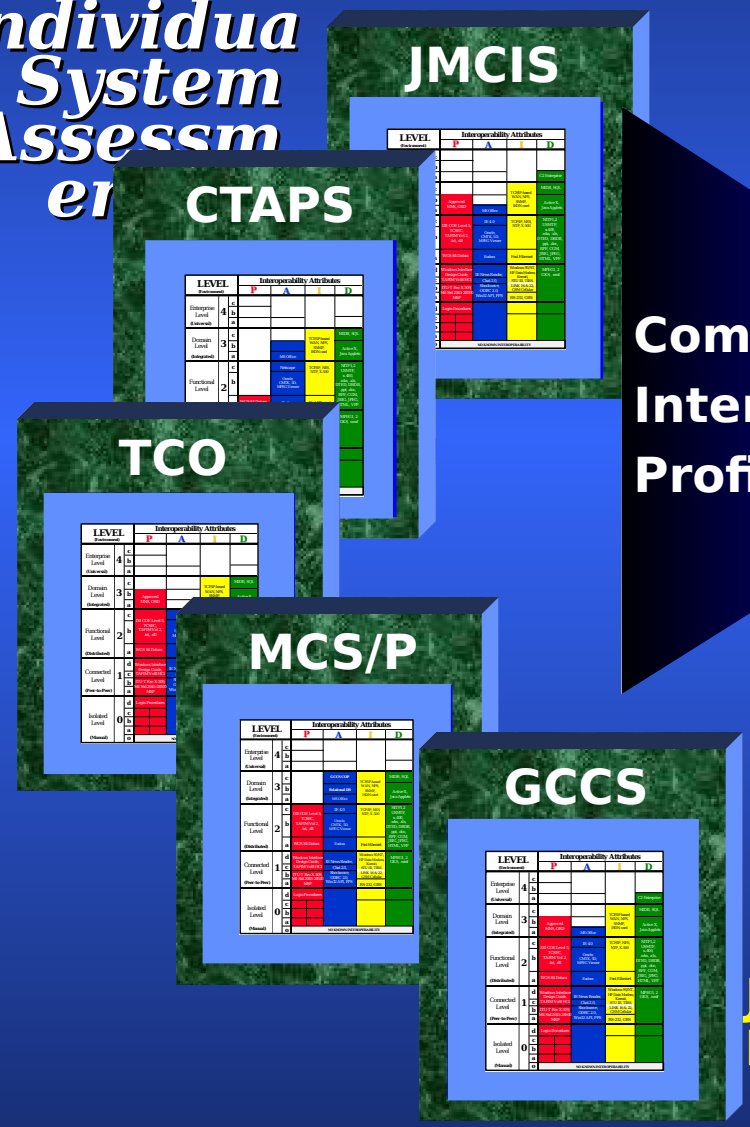
Level 2c achievable if Web interface provided

Level 2b achievable if standards-compliance issue is resolved

Current Level is 1b due to non-standard implementations

Multiple Systems Assessment - MIS Experiment

Individual System Assessment



Composite Interoperability Profile

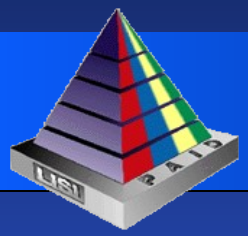
"System of Systems" Assessment

LEVEL			Interoperability Attributes P	A	I	D
Enterprise	4	c				
		b				
		a				
Domain	3	c			Common WAN	
		b				
		a				
Functional	2	c				
		b		Web Browser; Problem Area!		HTML
		a	COE			USMTF
Connected	1	d	JTA			
		c		FTP		
		b	Common Classification	X-Window		
		a				
Isolated	0	d	Media Exchange	Floppy Disk		
		c				
		b				
		a				
		o	NO KNOWN INTEROPERABILITY			

1c

Joint systems interoperability above Level 1c is impacted by incompatible implementations

The Too
Inspector



Inspector Discussion

- System Survey Questionnaire
- Sample LISI Reports
- Other Inspector Surveys & Reports
  - ISO OSI Model
  - DII COE Runtime Environment Compliance Model
- Relationship to Other Tools

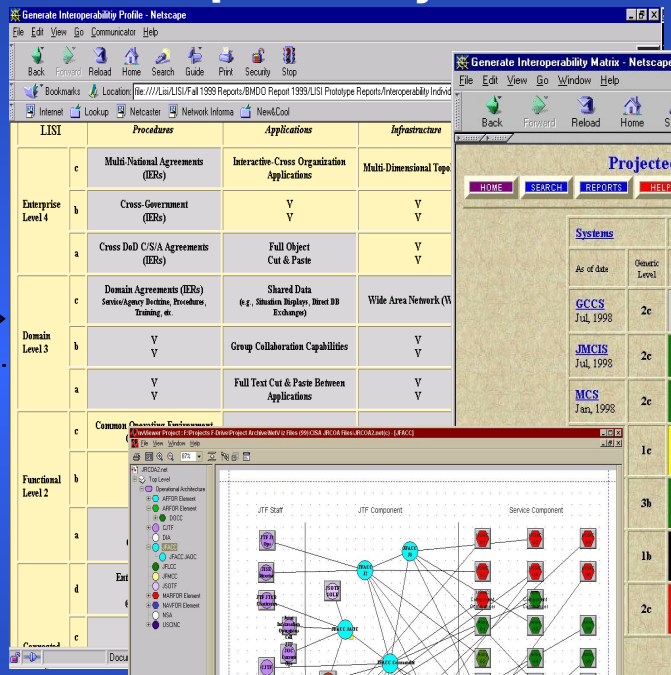
Inspector 1.0

Inspector
System Survey Questionnaire

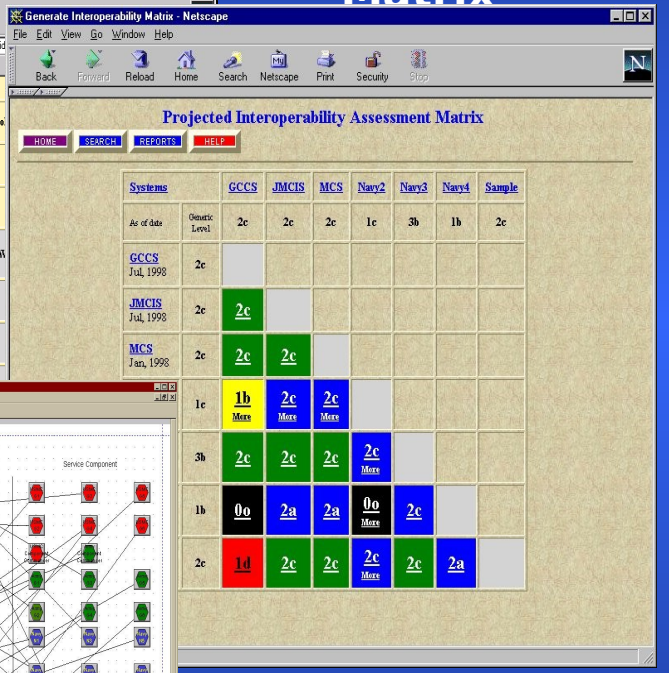
Inspector 1.0 - Netscape
Inspector
version 1.0
Access Data - Netscape
System X
ADMIN
SEARCH
HELP
Unclassified
REGISTRATION
FULL SURVEY
Relationships
Attributes
Categories
[WebFmt] World Wide Web: What kinds of web browser data formats can be imported (read) or produced (write) by the item being registered?
Read Write Type Description
1 HTML Hyper Text Markup Language
2 SGML Standard Graphics Markup Language
3 XML eXtended Markup Language
4 VRML VR Markup Language
5 ActiveX Microsoft ActiveX
6 JavaApplets Java Applets
7 Java(Dynamic) Dynamic Java
8 JavaScript Java Script Language
9 Other
[AVFmt] Audio/Video Data Formats: What audio and video data formats can be read or written?
Read Write Format Description Standard
1 au Audio Sound File
2 JPEG 2000 JPEG 2000
3 mov Video (Movie)
4 MPEG 1 Motion Pictures Experts Group (CD ROM) JTA 2.2.2.1.4.6
5 MPEG 2 Motion Pictures Experts Group (HDTV) JTA 2.2.2.1.4.6
6 qt QuickTime File Format
7 RecVoice Recorded voice
8 wav Wave Sound File
Document Done

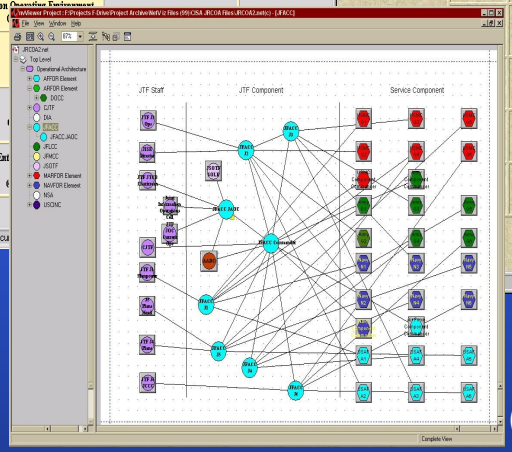
LISI Reports

LISI System Interoperability Profile



LISI System² Interoperability Matrix





OSI-Based Reports,
DII COE I&RTS Reports,
MSTAR Reports, ...

Architecture Perspectives (e.g., NetViz)

Inspector 1.0 features a Web-based questionnaire and generates LISI-, OSI-, DII COE-, MSTAR-based, etc. reports based on the capabilities and implementations identified by the PMs and system developers

Inspector Supports Multiple Surveys & Models

Profiled Data

Inspector

Other Common Reference Models

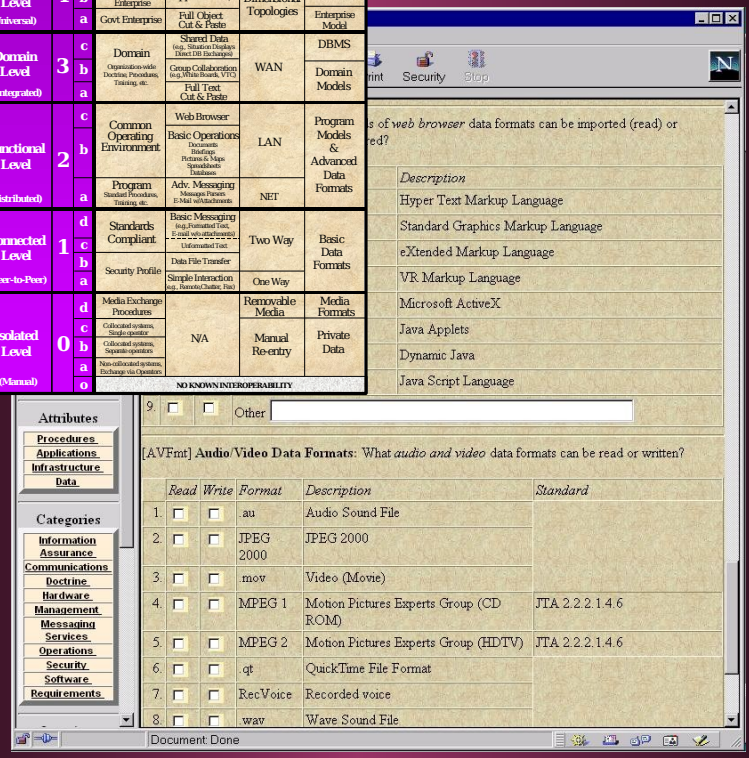
DII COE V4.0

MARCOR MSTAR

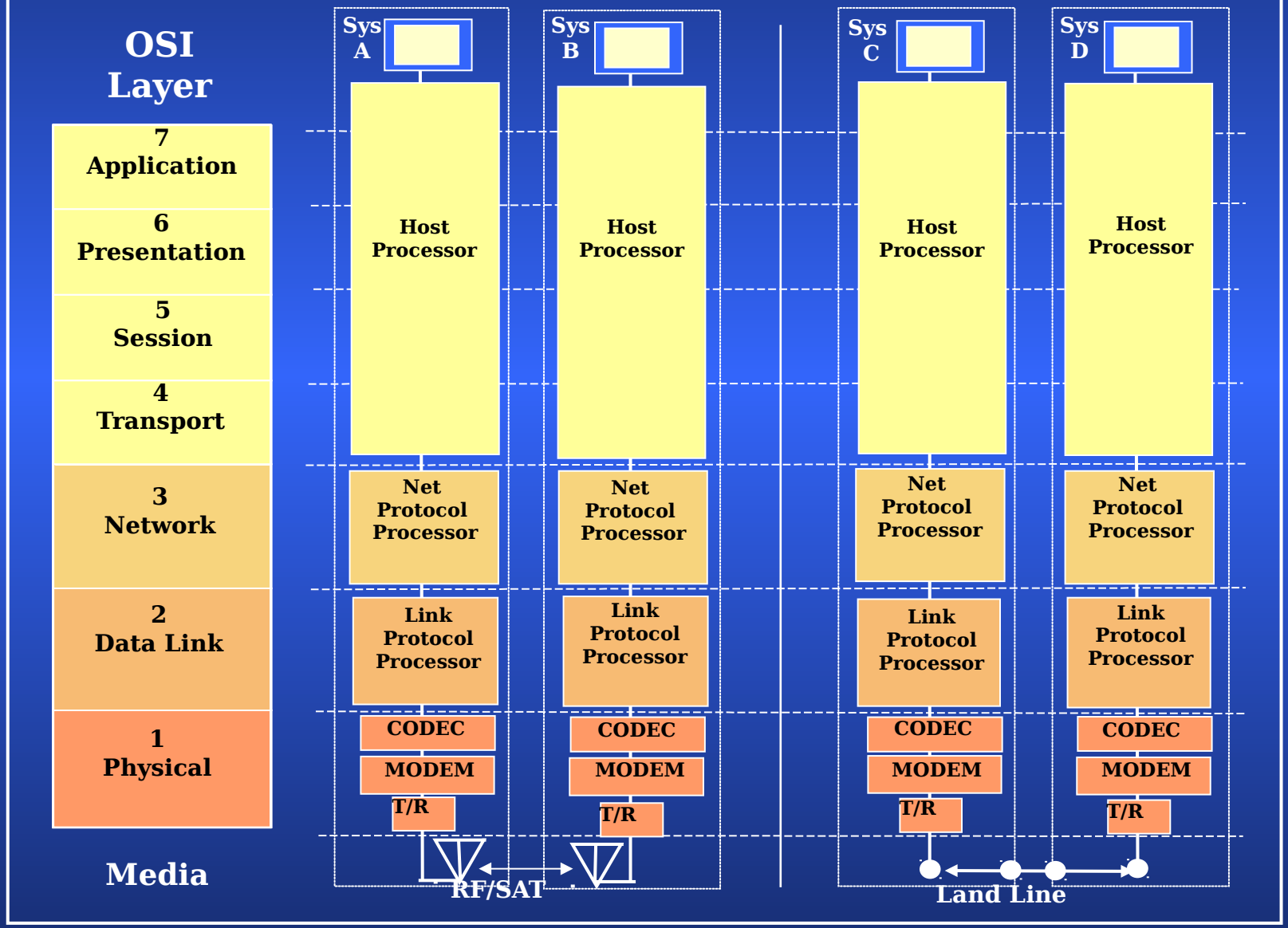
OSI Reference Model

LISI

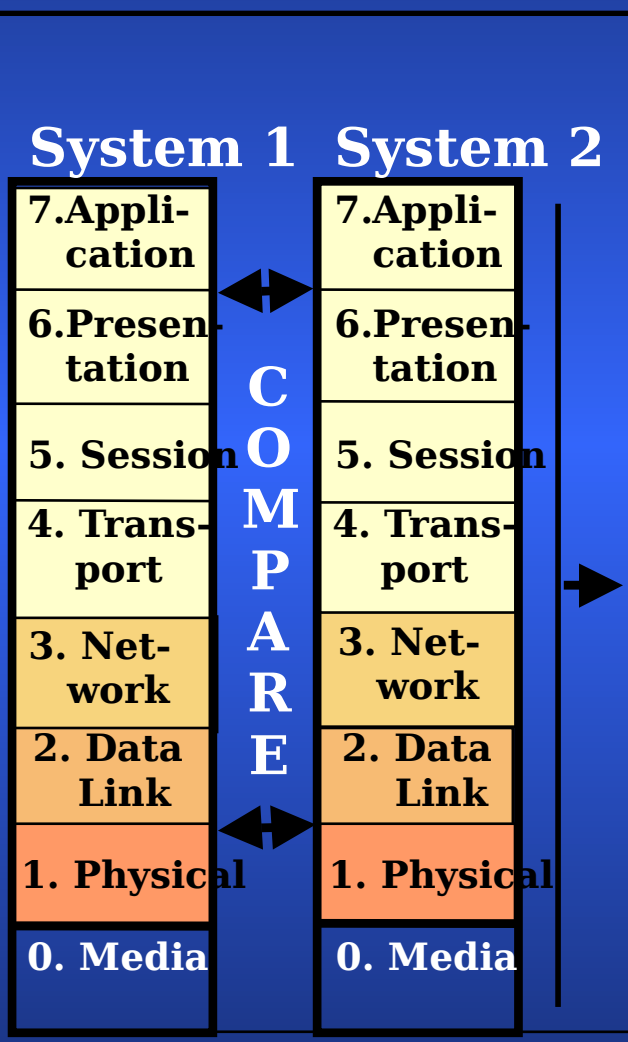
LEVEL (Environment)			Interoperability Attributes P	A	I	D
Enterprise Level (Universal)	4	c	Multi-National Enterprises	Interactive (cross applications)	Multi-Dimensional Topologies	Cross-Enterprise Models
		b	Cross Government Enterprise			
		a	Govt Enterprise	Full Object Cut & Paste		Enterprise Model
Domain Level (Integrated)	3	c	Domain (Organization-wide Doctrine, Procedures, Training, etc.)	Shared Data (e.g., Situation Displays, Direct DB Exchanges)	WAN	DBMS
		b		Group Collaboration (e.g., White Boards, VTC)		Domain Models
		a		Full Text Cut & Paste		
Functional Level (Distributed)	2	c	Common Operating Environment	Web Browser	LAN	Program Models & Advanced Data Formats
		b		Basic Operations (Documents, Briefings, Pictures & Maps, Spreadsheets, Databases)		
		a	Program (Standard Procedures, Training, etc.)	Adv. Messaging (Messages, Forums, E-Mail w/Attachments)	NET	
Connected Level (Peer-to-Peer)	1	d	Standards Compliant	Basic Messaging (e.g., Formatted Text, E-mail w/o attachments)	Two Way	Basic Data Formats
		c		Unformatted Text		
		b	Security Profile	Data File Transfer		
		a		Simple Interaction (e.g., Remote Chatter, Fax)	One Way	
Isolated Level (Manual)	0	d	Media Exchange Procedures	N/A	Removable Media	Media Formats
		c	Collocated systems, Single operator		Manual Re-entry	Private Data
		b	Collocated systems, Separate operators			
		a	Non-collocated systems, Exchange via Operators			
		o	NO KNOWN INTEROPERABILITY			



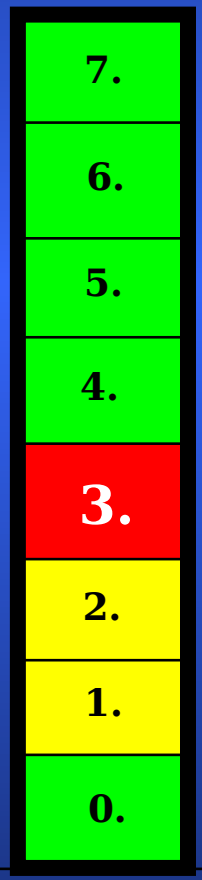
Integrating the OSI Reference Model



OSI Comparison of Two Systems



Results of Comparison



- 7. → All Items Equate
- 6. → All Items Equate
- 5. → All Items Equate
- 4. → All Items Equate
- 3. → Functional Level
  - - No Entry for Either Sys
- 2. → Format Level
  - -Item X : Sys 1- AAA; Sys 2- BBB
- 1. → Method Level
  - -Item Y : Sys 1- CCC; Sys 2- DDD
- 0. → All Items Equate

"Interoperability" Tool Relationships

System implementations needed to support information exchange

Compatibility and rules compliance of system implementations

JCAPS
MSTAR
InterPRO
NAD
RAD
...

Inspector (LISI)
JOTID
...

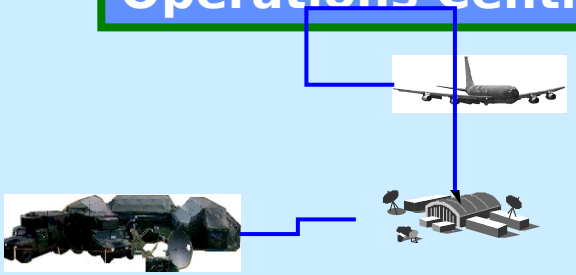
TULIP
DART
ERWIN
...

Information Exchange

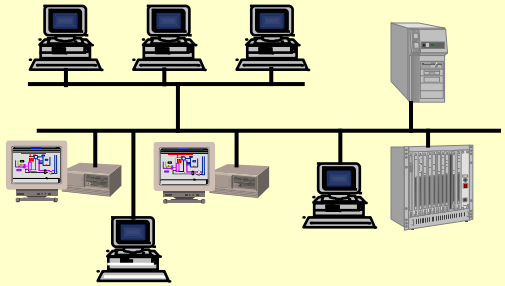
System Implementations

Implementation Compatibility, Compliance, & Engineering

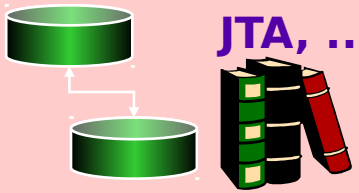
Operations Centric



System Centric



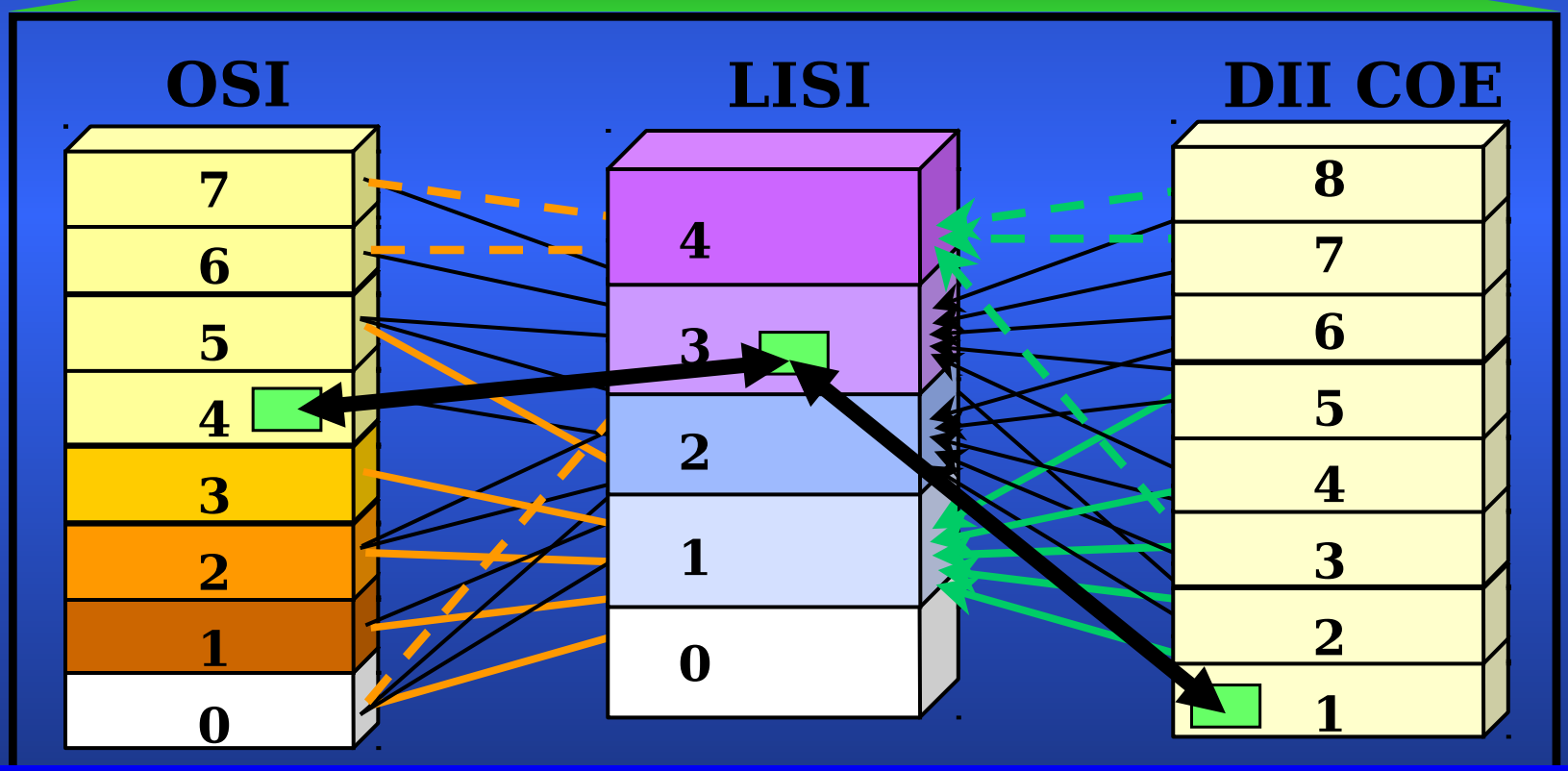
Data Centric



Relationship of Inspector Tool to Reference Models

System Profile Data

Inspector



Relationship of *"TCP"* Protocol within Various Models

"Drill Down" Example Using TADIL-J

Message

- *VMF*
- *USMTF*
- *TADIL*

...

TADIL Type

- *TADIL A*
- *TADIL B*
- *TADIL J*

...

Message Catalog

- *Network Mgmt*
- *PPLI*
- *Surveillance*
- *ASW*
- *Info Mgmt*
- *Weapons CM*
- *Control*
- *Platform/system st*
- *EW*
- *National Use*
- *Misc*

TADIL J3.0-J3.7

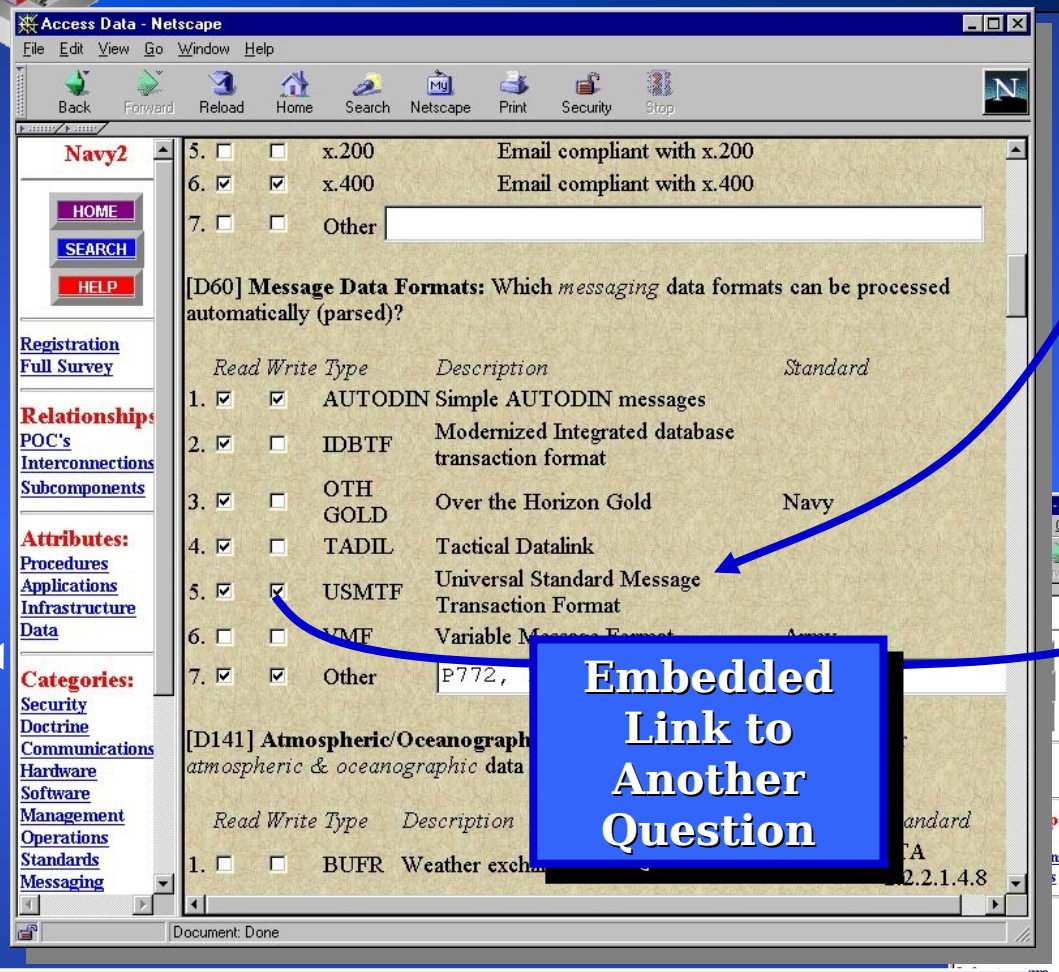
Version X.x

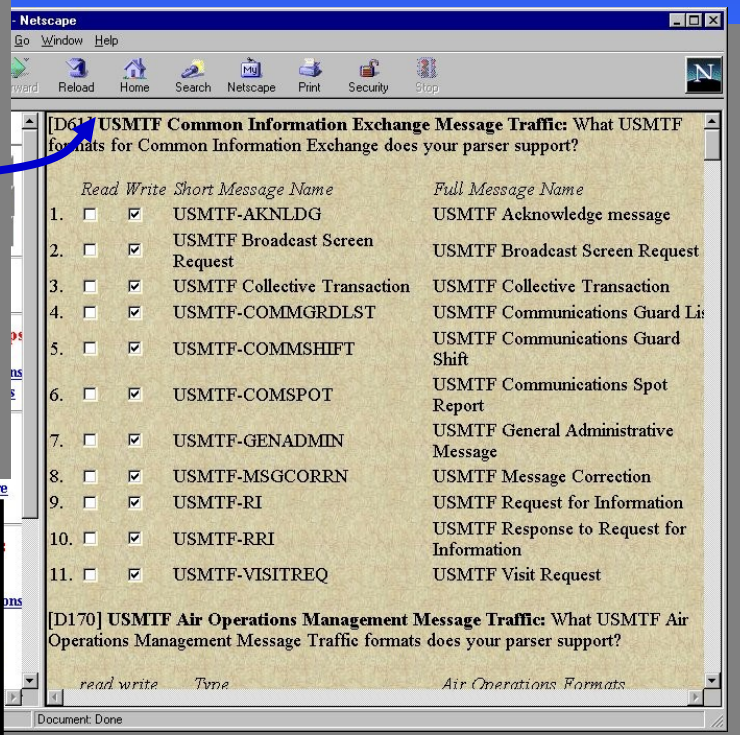
J3.0 Reference Point
J3.1 Emer Point
J3.2 Air Track
J3.3 Surface Track
J3.4 Subsurface Track
J3.5 Land Point/Track
J3.7 EW Product Info

TADIL xxx

A sequence of hierarchical questions can be used to penetrate any given issue to the degree necessary to ascertain whether interoperability gaps or shortfalls exist between

LISI Survey Questionnaire



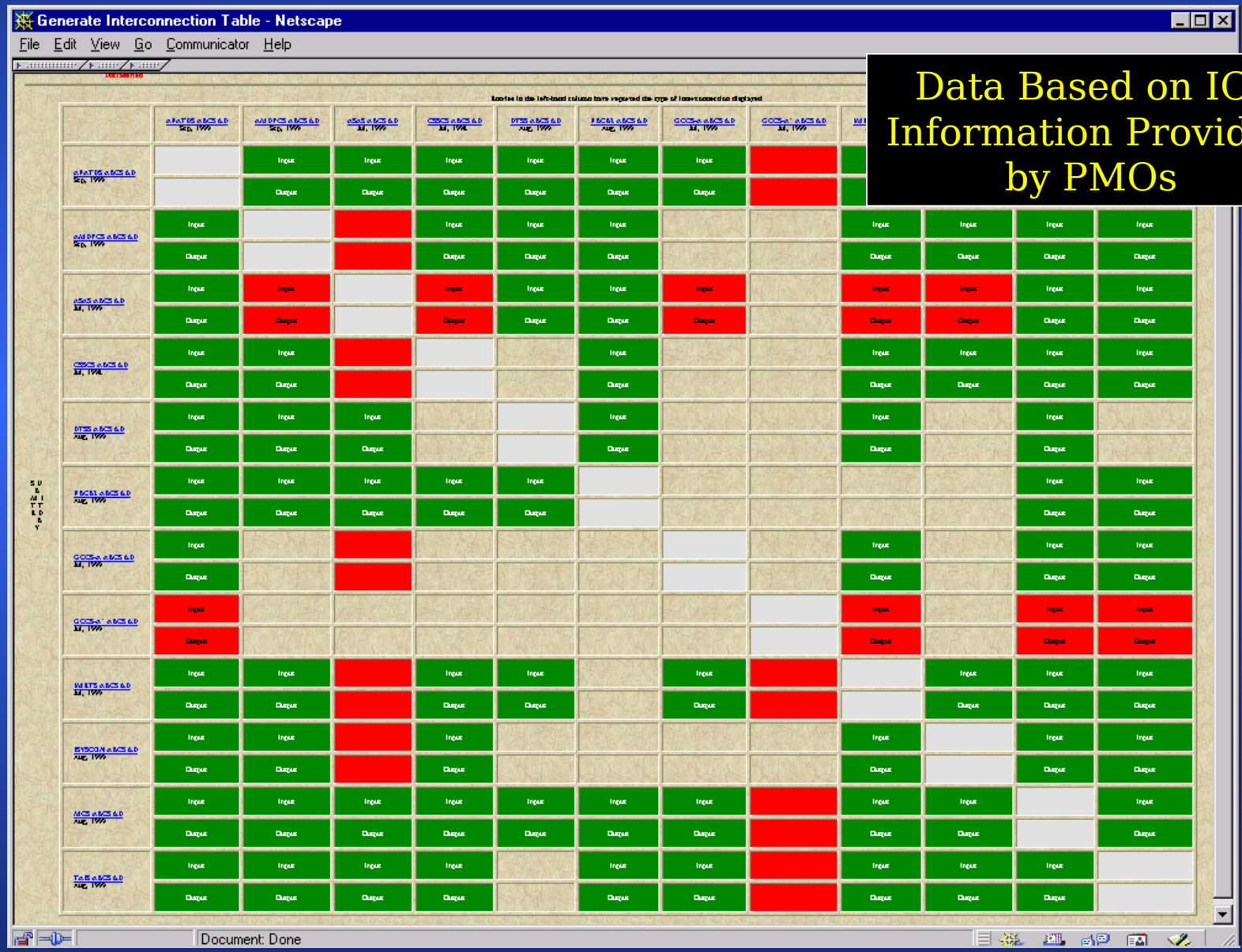

Netscape
Go Window Help
Reload Home Search Netscape Print Security Stop
[D61] USMTF Common Information Exchange Message Traffic: What USMTF formats for Common Information Exchange does your parser support?
Read Write Short Message Name Full Message Name
1. USMTF-AKNLDG USMTF Acknowledge message
2. USMTF Broadcast Screen Request USMTF Broadcast Screen Request
3. USMTF Collective Transaction USMTF Collective Transaction
4. USMTF-COMMGRDLST USMTF Communications Guard Lis
5. USMTF-COMMSHIFT USMTF Communications Guard Shift
6. USMTF-COMSPOT USMTF Communications Spot Report
7. USMTF-GENADMIN USMTF General Administrative Message
8. USMTF-MSGCORRN USMTF Message Correction
9. USMTF-RI USMTF Request for Information
10. USMTF-RRI USMTF Response to Request for Information
11. USMTF-VISITREQ USMTF Visit Request
[D170] USMTF Air Operations Management Message Traffic: What USMTF Air Operations Management Message Traffic formats does your parser support?
read write Type Air Operations Formats
Document: Done

Questions are organized hierarchically to accommodate increasing levels of detail (i.e., "drill down" approach) for interoperability analysis.

Embedded Link to Another Question

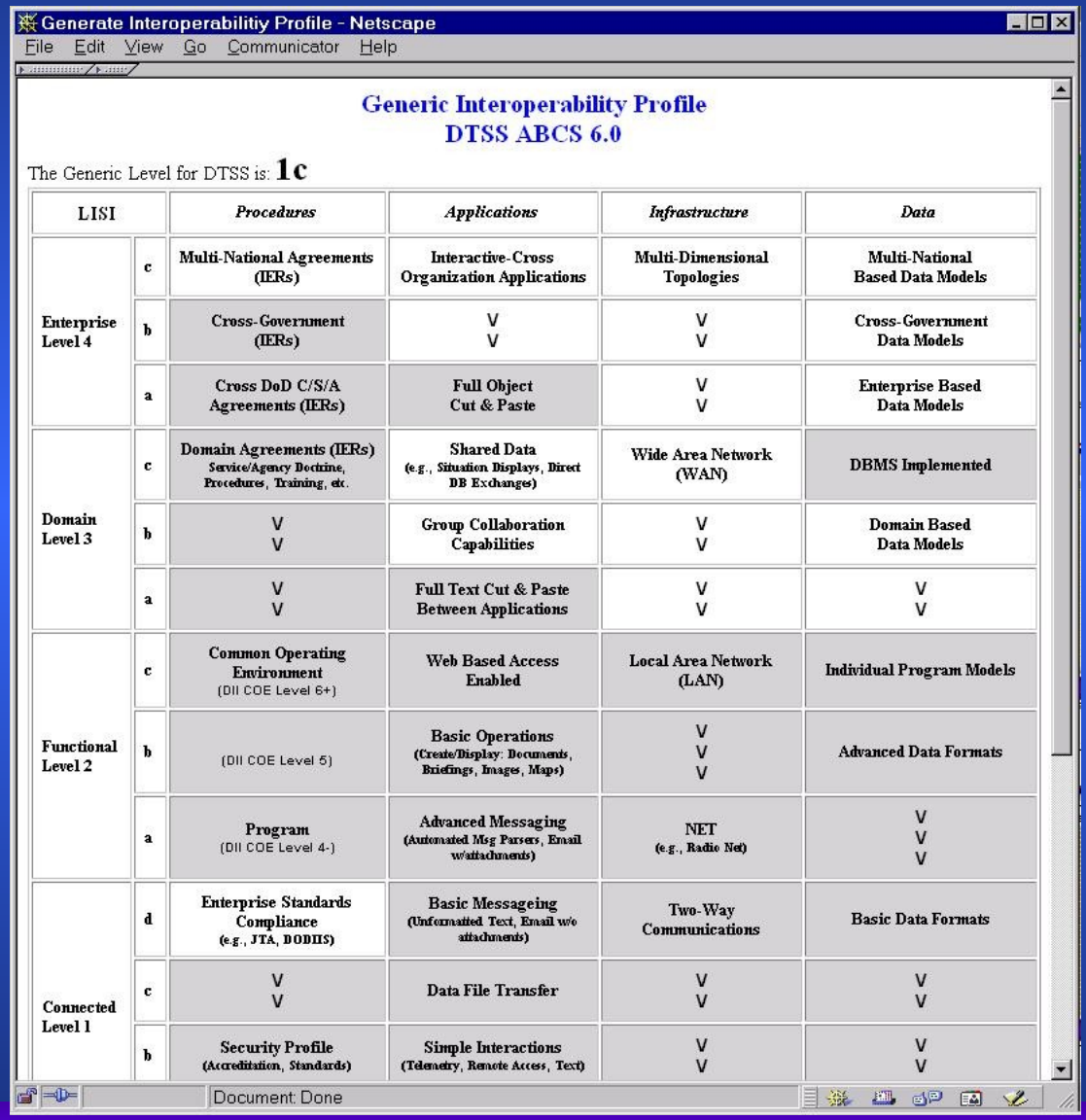
The survey is organized and can be displayed according to many different topic areas (e.g., in terms of the "PAID" attributes or as other categories of interest such as all questions involving "security" or "software"

Interconnection Table



Data Based on ICD Information Provided by PMOs

System Profiles - Abbreviated



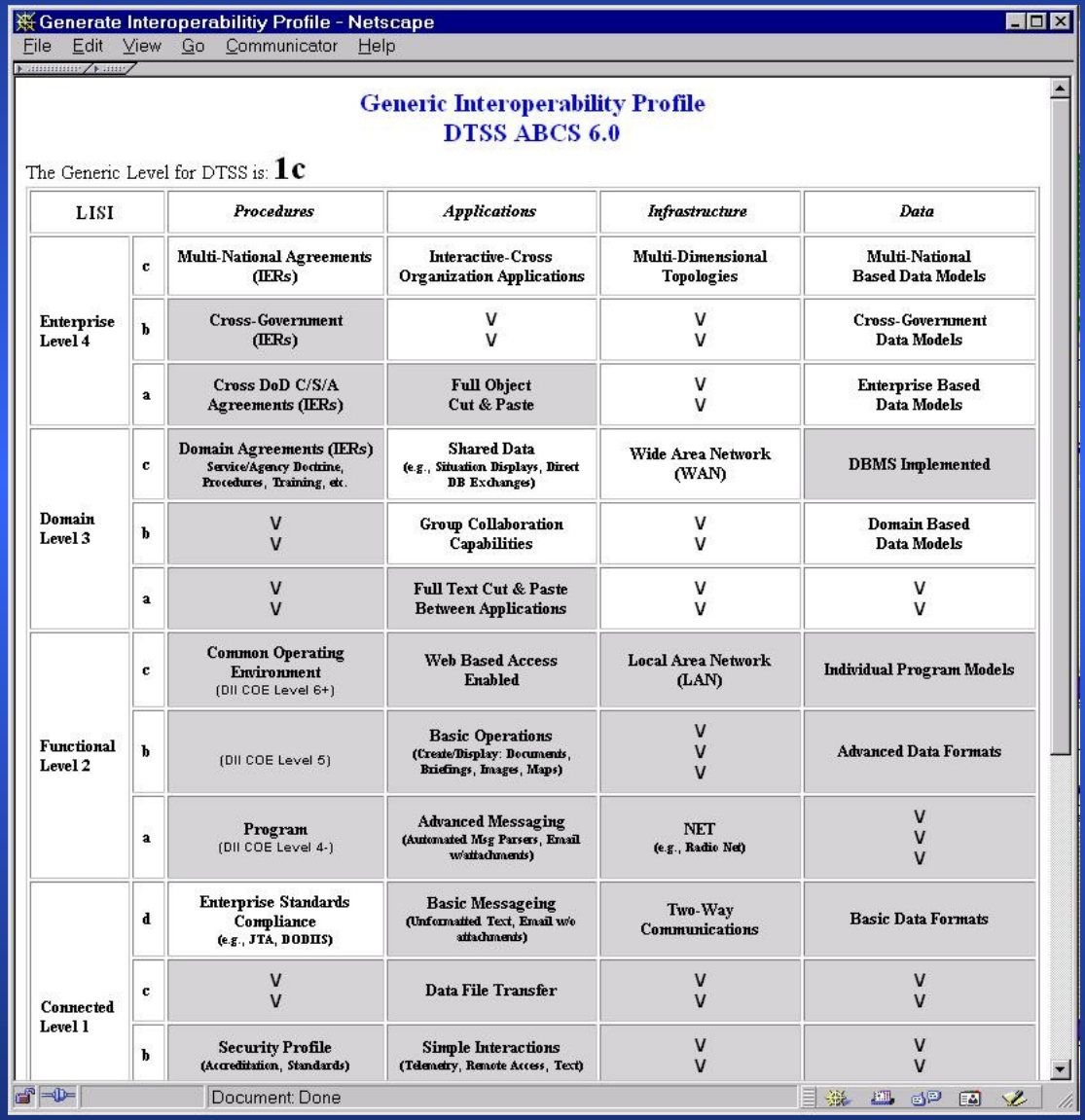
Generic Interoperability Profile
DTSS ABCS 6.0

The Generic Level for DTSS is: **1c**

LISI		*Procedures*	*Applications*	*Infrastructure*	*Data*
Enterprise Level 4	c	Multi-National Agreements (IERs)	Interactive-Cross Organization Applications	Multi-Dimensional Topologies	Multi-National Based Data Models
	b	Cross-Government (IERs)	V V	V V	Cross-Government Data Models
	a	Cross DoD C/S/A Agreements (IERs)	Full Object Cut & Paste	V V	Enterprise Based Data Models
Domain Level 3	c	Domain Agreements (IERs) Service/Agency Doctrine, Procedures, Training, etc.	Shared Data (e.g., Situation Displays, Direct DB Exchanges)	Wide Area Network (WAN)	DBMS Implemented
	b	V V	Group Collaboration Capabilities	V V	Domain Based Data Models
	a	V V	Full Text Cut & Paste Between Applications	V V	V V
Functional Level 2	c	Common Operating Environment (DII COE Level 6+)	Web Based Access Enabled	Local Area Network (LAN)	Individual Program Models
	b	(DII COE Level 5)	Basic Operations (Create/Display: Documents, Briefings, Images, Maps)	V V V	Advanced Data Formats
	a	Program (DII COE Level 4-)	Advanced Messaging (Automated Msg Parsers, Email w/attachments)	NET (e.g., Radio Net)	V V V
Connected Level 1	d	Enterprise Standards Compliance (e.g., JTA, DODIIS)	Basic Messageing (Unformatted Text, Email w/o attachments)	Two-Way Communications	Basic Data Formats
	c	V V	Data File Transfer	V V	V V
	b	Security Profile (Accreditation, Standards)	Simple Interactions (Telemetry, Remote Access, Text)	V V	V V

Profile of each system capability presented using

Single System Profile - Abbreviated



Generate Interoperabilitiy Profile - Netscape

File Edit View Go Communicator Help

Generic Interoperability Profile
DTSS ABCS 6.0

The Generic Level for DTSS is: **1c**

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Functional Level 2	c	Common Operating Environment (DII COE Level 6+)	Web Based Access Enabled	Local Area Network (LAN)	Individual Program Models
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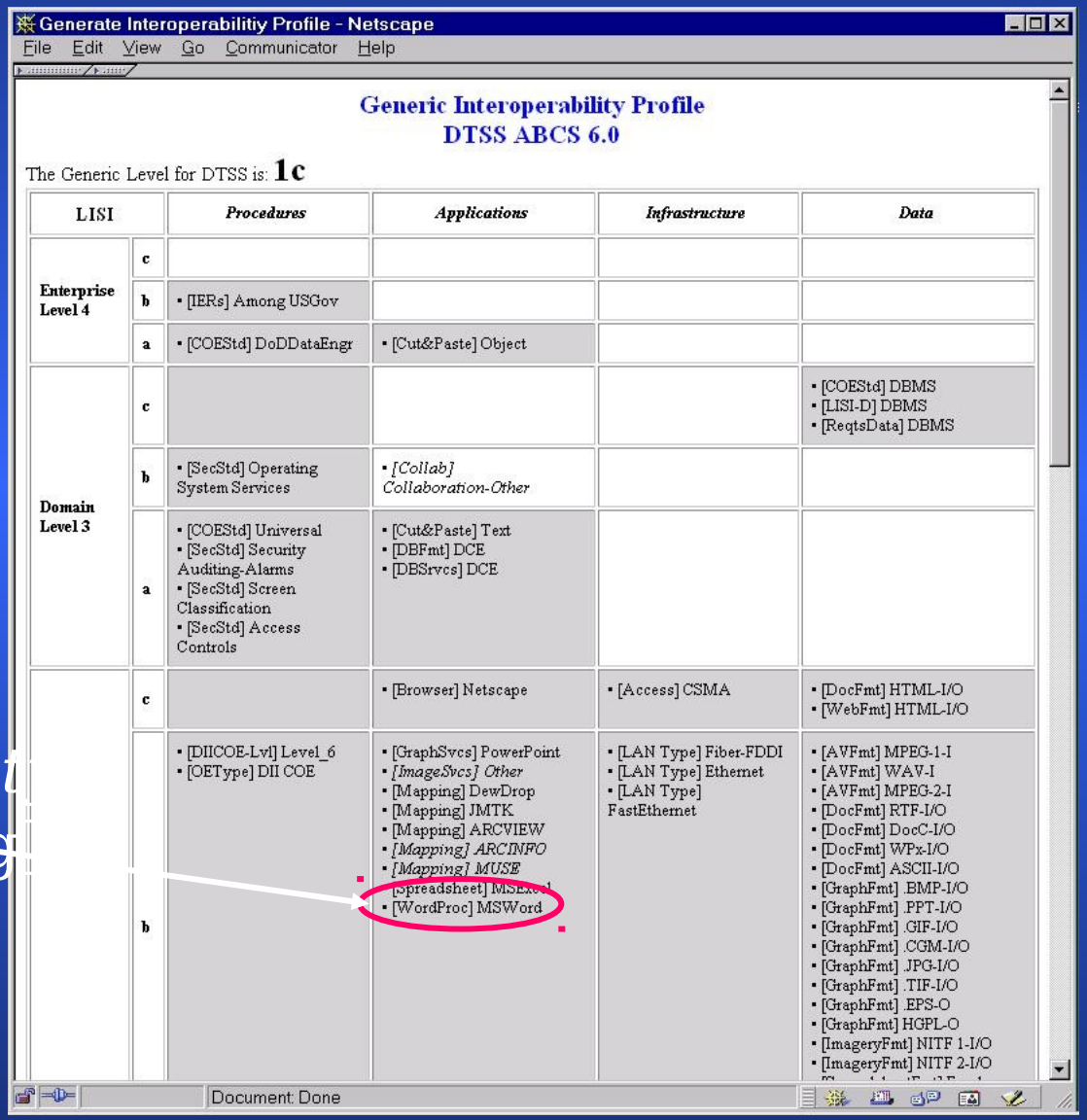
Connected Level 1	d	Enterprise Standards Compliance (e.g., JTA, DODIIS)	Basic Messageing (Unformatted Text, Email w/o attachments)	Two-Way Communications	Basic Data Formats
	c	V V	Data File Transfer	V V	V V
	b	Security Profile (Accreditation, Standards)	Simple Interactions (Telemetry, Remote Access, Text)	V V	V V

Document: Done

Standard System Profile

Example Capabilit
[Word Processing
MS Word



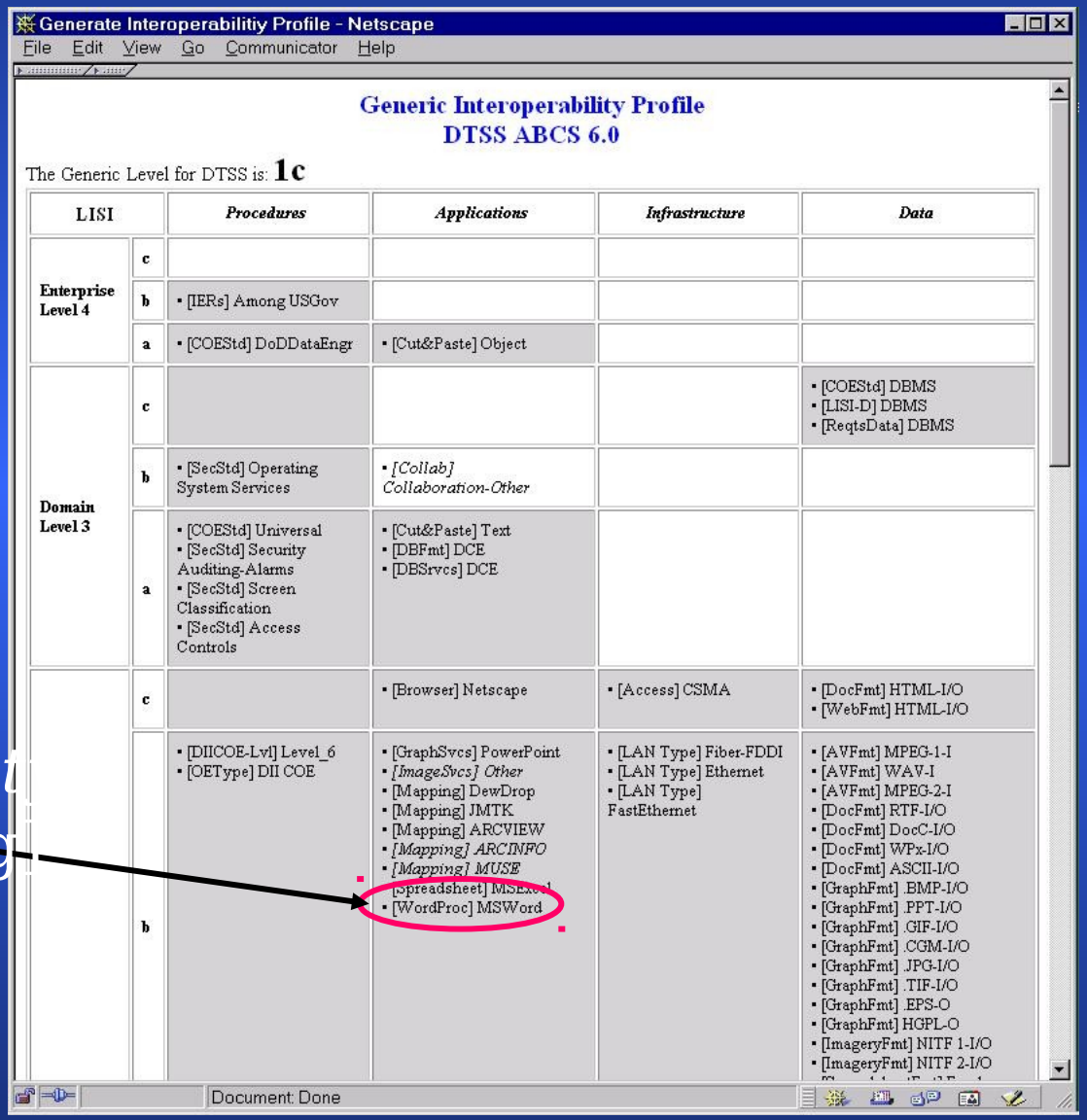
Generic Interoperability Profile
DTSS ABCS 6.0

The Generic Level for DTSS is: **1c**

LISI		*Procedures*	*Applications*	*Infrastructure*	*Data*
Enterprise Level 4	**c**				
	b	• [IERs] Among USGov			
	a	• [COEStd] DoDDataEngr	• [Cut&Paste] Object		
Domain Level 3	**c**				• [COEStd] DBMS • [LISI-D] DBMS • [ReqtsData] DBMS
	b	• [SecStd] Operating System Services	• *[Collab] Collaboration-Other*		
	a	• [COEStd] Universal • [SecStd] Security Auditing-Alarms • [SecStd] Screen Classification • [SecStd] Access Controls	• [Cut&Paste] Text • [DBFmt] DCE • [DBSrvcs] DCE		
	c		• [Browser] Netscape	• [Access] CSMA	• [DocFmt] HTML-I/O • [WebFmt] HTML-I/O
	b	• [DIICOE-Lvl] Level_6 • [OEType] DII COE	• [GraphSvcs] PowerPoint • *[ImageSvcs] Other* • [Mapping] DewDrop • [Mapping] JMTK • [Mapping] ARCVIEW • *[Mapping] ARCINFO* • *[Mapping] MUSE* • [Spreadsheet] MSExcel • [WordProc] MSWord	• [LAN Type] Fiber-FDDI • [LAN Type] Ethernet • [LAN Type] FastEthernet	• [AVFmt] MPEG-1-I • [AVFmt] WAV-I • [AVFmt] MPEG-2-I • [DocFmt] RTF-I/O • [DocFmt] DocC-I/O • [DocFmt] WPx-I/O • [DocFmt] ASCII-I/O • [GraphFmt] .BMP-I/O • [GraphFmt] .PPT-I/O • [GraphFmt] .GIF-I/O • [GraphFmt] .CGM-I/O • [GraphFmt] .JPG-I/O • [GraphFmt] .TIF-I/O • [GraphFmt] .EPS-O • [GraphFmt] HGPL-O • [ImageryFmt] NITF 1-I/O • [ImageryFmt] NITF 2-I/O

Single System Profile - Extended

Example Capabilit
[Word Processing
MS Word


Generate Interoperabilitiy Profile - Netscape
File Edit View Go Communicator Help
Generic Interoperability Profile
DTSS ABCS 6.0
The Generic Level for DTSS is: 1c
Document: Done

LISI		Procedures	Applications	Infrastructure	Data
Enterprise Level 4	c				
	b	• [IERs] Among USGov			
	a	• [COEStd] DoDDataEngr	• [Cut&Paste] Object		
Domain Level 3	c				• [COEStd] DBMS • [LISI-D] DBMS • [ReqtsData] DBMS
	b	• [SecStd] Operating System Services	• *[Collab] Collaboration-Other*		
	a	• [COEStd] Universal • [SecStd] Security Auditing-Alarms • [SecStd] Screen Classification • [SecStd] Access Controls	• [Cut&Paste] Text • [DBFmt] DCE • [DBSrvcs] DCE		
	c		• [Browser] Netscape	• [Access] CSMA	• [DocFmt] HTML-I/O • [WebFmt] HTML-I/O
	b	• [DIICOE-Lvl] Level_6 • [OEType] DII COE	• [GraphSvcs] PowerPoint • *[ImageSvcs] Other* • [Mapping] DewDrop • [Mapping] JMTK • [Mapping] ARCVIEW • *[Mapping] ARCINFO* • *[Mapping] MUSE* • [Spreadsheet] MSExcel • [WordProc] MSWord	• [LAN Type] Fiber-FDDI • [LAN Type] Ethernet • [LAN Type] FastEthernet	• [AVFmt] MPEG-1-I • [AVFmt] WAV-I • [AVFmt] MPEG-2-I • [DocFmt] RTF-I/O • [DocFmt] DocC-I/O • [DocFmt] WPx-I/O • [DocFmt] ASCII-I/O • [GraphFmt] .BMP-I/O • [GraphFmt] .PPT-I/O • [GraphFmt] .GIF-I/O • [GraphFmt] .CGM-I/O • [GraphFmt] .JPG-I/O • [GraphFmt] .TIF-I/O • [GraphFmt] .EPS-O • [GraphFmt] HGPL-O • [ImageryFmt] NITF 1-I/O • [ImageryFmt] NITF 2-I/O

Specific Profile (2 or more systems) - Extended

Generate Interoperabilitiy Profile - Netscape

File Edit View Go Communicator Help

Extended Specific Interoperability Profile
CSSCS ABCS 6.0
DTSS ABCS 6.0

HOME SEARCH REPORTS HELP

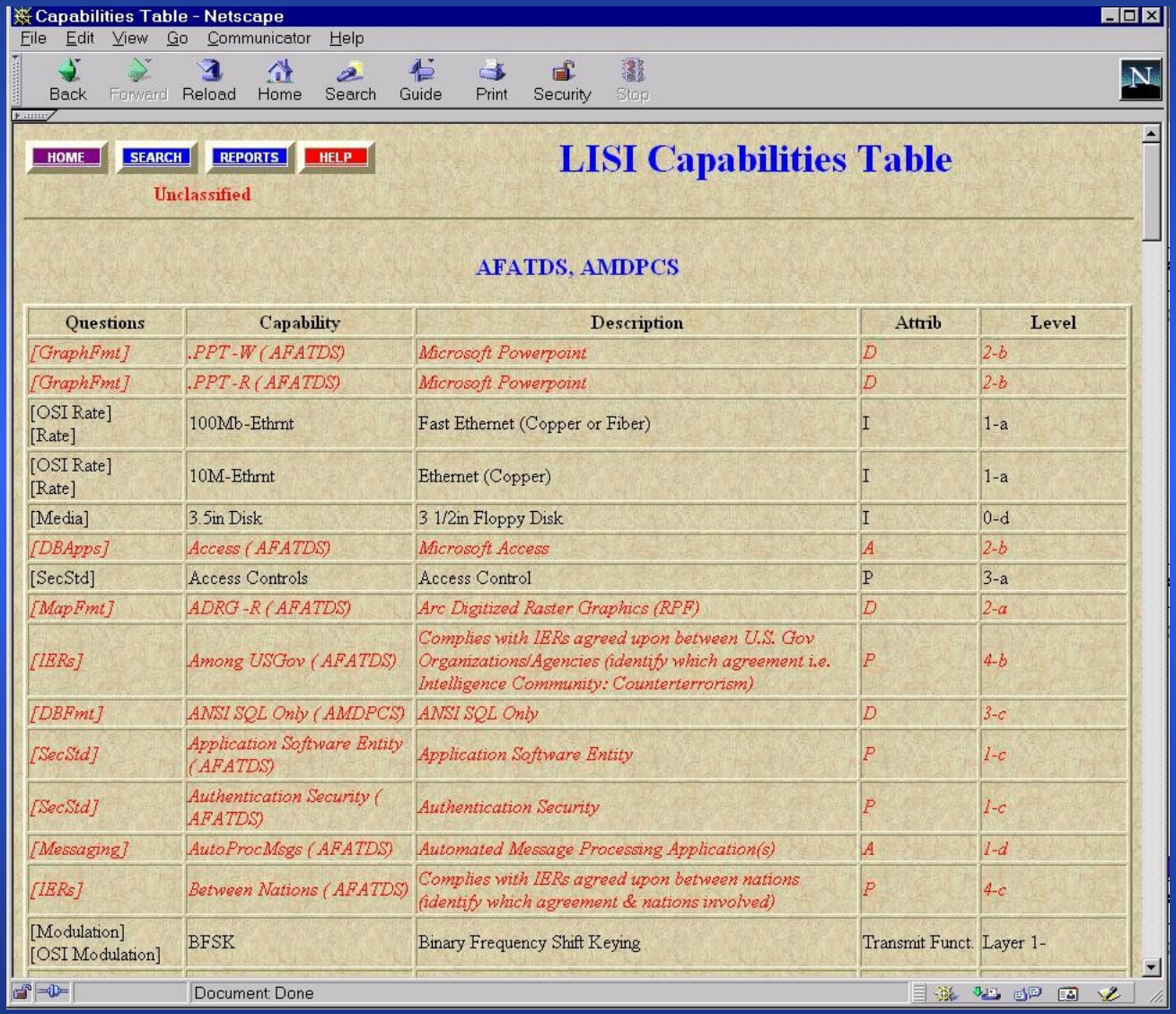
Unclassified

The Specific Level for this pair is: **2c**

LISI		*Procedures*	*Applications*	*Infrastructure*	*Data*
Enterprise Level 4	c				
	b	[IERs] Among USGov (DTSS)			
	a	[COEStd] DoDDataEngr (DTSS)	[Cut&Paste] Object (DTSS)		
Domain Level 3	c	[IERs] Within Domain (CSSCS)	[DBApps] Informix (CSSCS)	[WAN] NIPRNET (CSSCS) [WAN] SIPRNET (CSSCS)	[COEStd] DBMS (DTSS) [LISI-D] DBMS (DTSS) [ReqtsData] DBMS (DTSS)
	b	[SecStd] Operating System Services (DTSS)	*[Collab] Collaboration-Other (DTSS)* [DoDCaps] COP (CSSCS)		
	a	[COEStd] Universal (DTSS) [SecStd] Security Auditing-Alarms [SecStd] Screen Classification [SecStd] Access Controls	[Cut&Paste] Text [DBFmt] DCE [DBSrvcs] DCE	[Proto-TCP/IP] TCP/IP (CSSCS) [Proto-TCP/IP] TCP (CSSCS)	
	c		[Browser] Netscape	[Access] CSMA (DTSS)	[DocFmt] HTML-I/O [WebFmt] HTML-I/O
		[DIICOE-Lvl] Level_6 [OEType] DII COE	[GraphSvcs] PowerPoint *[ImageSvcs] Other (DTSS)* [Mapping] DewDrop (DTSS) [Mapping] JMTK [Mapping] ARCVIEW (DTSS) *[Mapping] ARCINFO (DTSS)* *[Mapping] MUSE (DTSS)*	[LAN Type] Fiber-FDDI (DTSS) [LAN Type] Ethernet [LAN Type] FastEthernet	[AVFmt] MPEG-1 (DTSS)-I [AVFmt] WAV (DTSS)-I [AVFmt] MPEG-2 (DTSS)-I [DocFmt] RTF (DTSS)-I [DocFmt] RTF (DTSS)-O [DocFmt] DocC (DTSS)-I [DocFmt] DocC (DTSS)-O

Black shows capabilities in common between systems
Red shows what is different between systems (who)

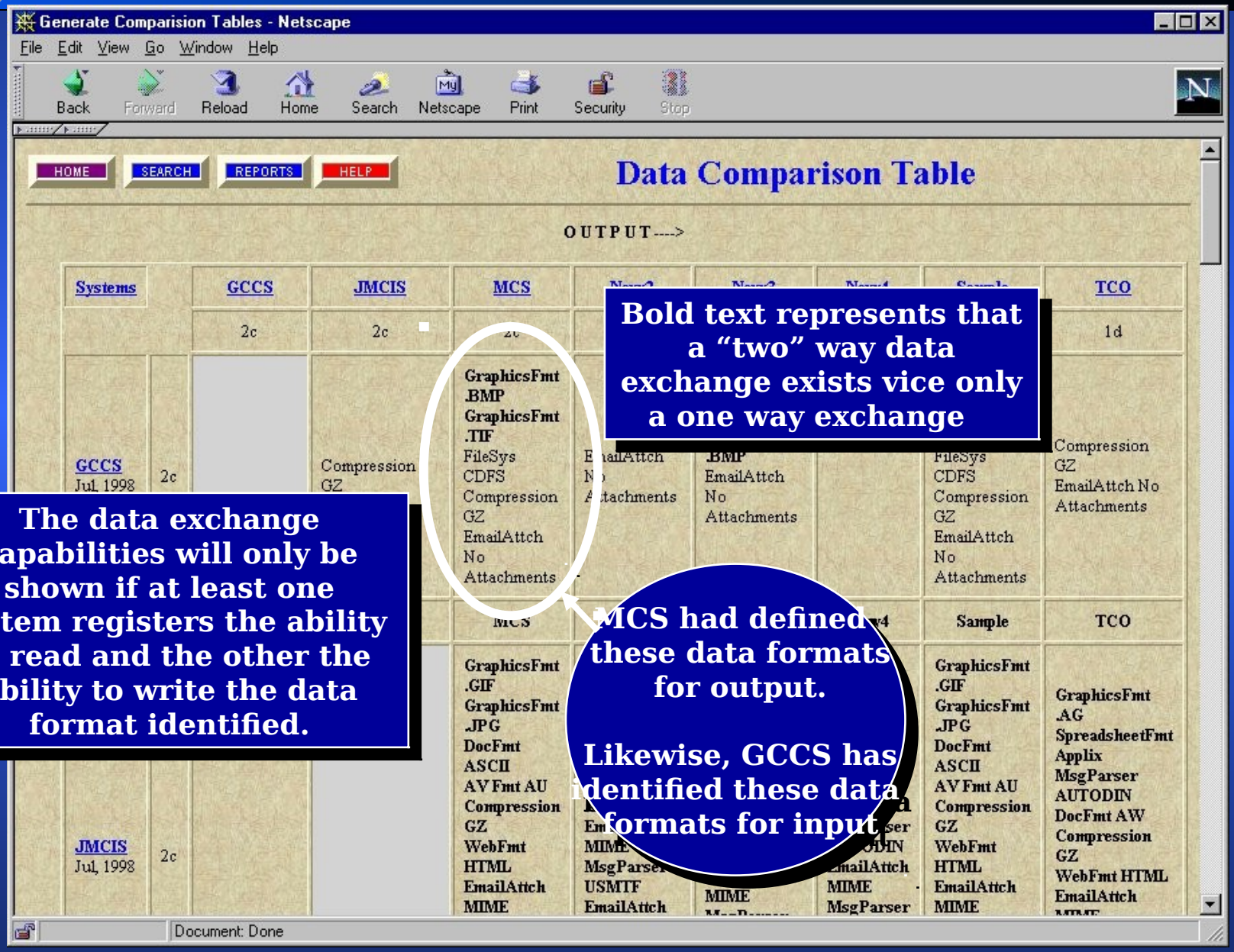
Capabilities Table



Questions	Capability	Description	Attrib	Level
[GraphFmt]	*.PPT-W (AFATDS)*	*Microsoft Powerpoint*	*D*	*2-b*
[GraphFmt]	*.PPT-R (AFATDS)*	*Microsoft Powerpoint*	*D*	*2-b*
[OSI Rate] [Rate]	100Mb-Ethrnt	Fast Ethernet (Copper or Fiber)	I	1-a
[OSI Rate] [Rate]	10M-Ethrnt	Ethernet (Copper)	I	1-a
[Media]	3.5in Disk	3 1/2in Floppy Disk	I	0-d
[DBApps]	*Access (AFATDS)*	*Microsoft Access*	*A*	*2-b*
[SecStd]	Access Controls	Access Control	P	3-a
[MapFmt]	*ADRG-R (AFATDS)*	*Arc Digitized Raster Graphics (RPF)*	*D*	*2-a*
[IERs]	*Among USGov (AFATDS)*	*Complies with IERs agreed upon between U.S. Gov Organizations/Agencies (identify which agreement i.e. Intelligence Community: Counterterrorism)*	*P*	*4-b*
[DBFmt]	*ANSI SQL Only (AMDPCS)*	*ANSI SQL Only*	*D*	*3-c*
[SecStd]	*Application Software Entity (AFATDS)*	*Application Software Entity*	*P*	*1-c*
[SecStd]	*Authentication Security (AFATDS)*	*Authentication Security*	*P*	*1-c*
[Messaging]	*AutoProcMsgs (AFATDS)*	*Automated Message Processing Application(s)*	*A*	*1-d*
[IERs]	*Between Nations (AFATDS)*	*Complies with IERs agreed upon between nations (identify which agreement & nations involved)*	*P*	*4-c*
[Modulation] [OSI Modulation]	BFSK	Binary Frequency Shift Keying	Transmit Funct.	Layer 1-

List of all capabilities cited in each system survey–and where they

Data Comparison Table



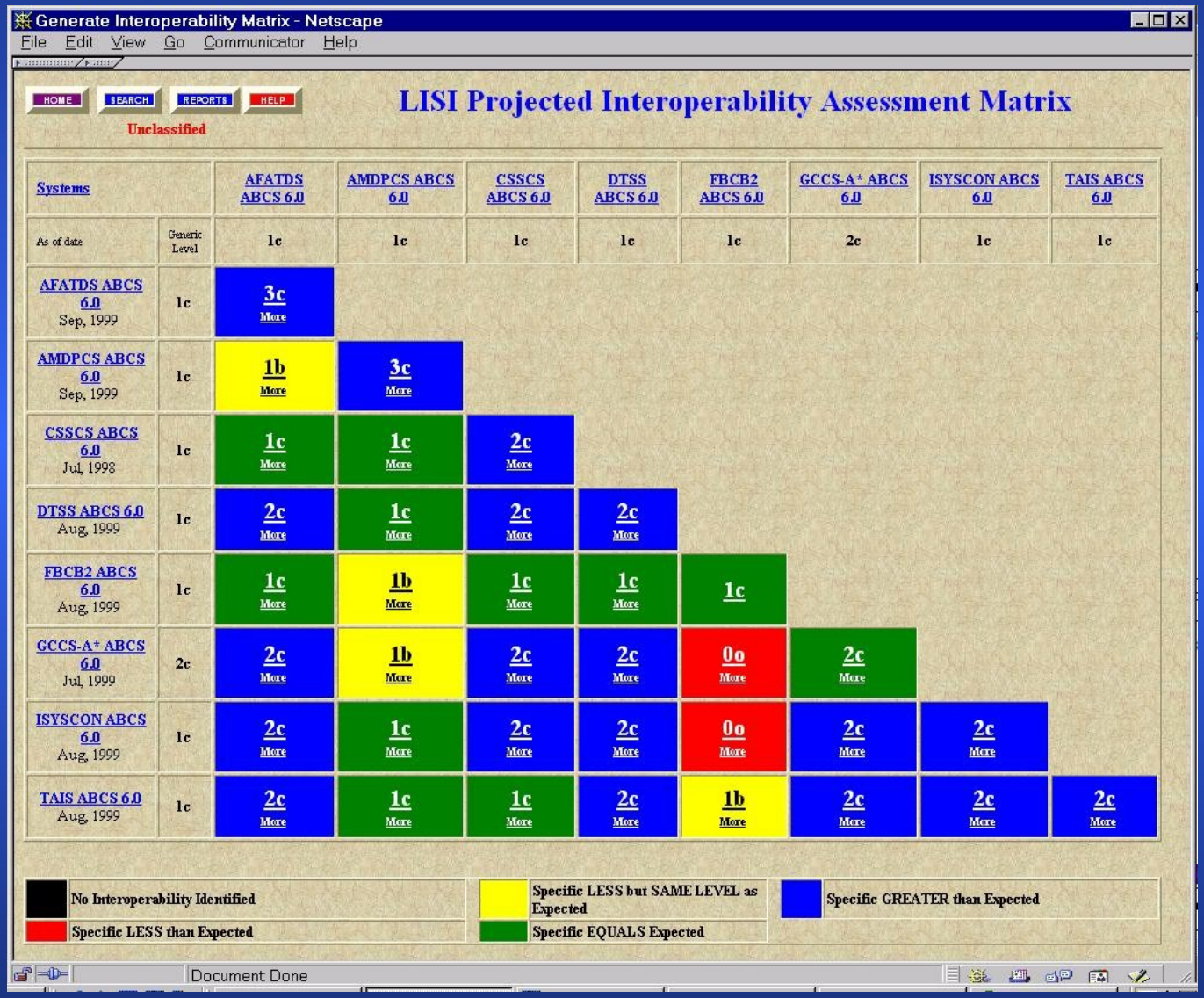
Bold text represents that a "two" way data exchange exists vice only a one way exchange

The data exchange capabilities will only be shown if at least one system registers the ability to read and the other the ability to write the data format identified.

MCS had defined these data formats for output.

Likewise, GCCS has identified these data formats for input

Interoperability Assessment Matrix


Generate Interoperability Matrix - Netscape
File Edit View Go Communicator Help
HOME SEARCH REPORTS HELP
Unclassified
LISI Projected Interoperability Assessment Matrix
Systems
AFATDS ABCS 6.0
AMDPCS ABCS 6.0
CSSCS ABCS 6.0
DTSS ABCS 6.0
FBCB2 ABCS 6.0
GCCS-A* ABCS 6.0
ISYSCON ABCS 6.0
TAIS ABCS 6.0
As of date
Generic Level
1c 1c 1c 1c 1c 2c 1c 1c
AFATDS ABCS 6.0 Sep, 1999 1c 3c More
AMDPCS ABCS 6.0 Sep, 1999 1c 1b More 3c More
CSSCS ABCS 6.0 Jul, 1998 1c 1c More 1c More 2c More
DTSS ABCS 6.0 Aug, 1999 1c 2c More 1c More 2c More 2c More
FBCB2 ABCS 6.0 Aug, 1999 1c 1c More 1b More 1c More 1c More 1c
GCCS-A* ABCS 6.0 Jul, 1999 2c 2c More 1b More 2c More 2c More 0o More 2c More
ISYSCON ABCS 6.0 Aug, 1999 1c 2c More 1c More 2c More 2c More 0o More 2c More 2c More
TAIS ABCS 6.0 Aug, 1999 1c 2c More 1c More 1c More 2c More 1b More 2c More 2c More 2c More
No Interoperability Identified
Specific LESS than Expected
Specific LESS but SAME LEVEL as Expected
Specific EQUALS Expected
Specific GREATER than Expected
Document: Done

PATRIOT-AEGIS Assessment Findings

LISI Interoperability Assessment Matrix

Systems		AEGIS 5.3B BL 5 Phase 3B	AEGIS 6.3 BL 6 Phase 3	PATRIOT 2.4 Config 2 PDB 4	
As of date	Generic Level	2a	2a	2a	
AEGIS 5.3B BL 5 Phase 3B Aug, 1999	2a	2a	3b		
AEGIS 6.3 BL 6 Phase 3 Aug, 1999	2a	2a			
PATRIOT 2.4 Config 2 PDB 4 Aug, 1999	2a	2a	2a	2a	3c
PATRIOT 3.5 Config 3 PDB 5 Aug, 1999	2a	2a	2a	2a	

PATRIOT & AEGIS each made significant internal upgrades

- Domain-level data models
- More applications (e.g., mapping, web browser)
- WAN access

But

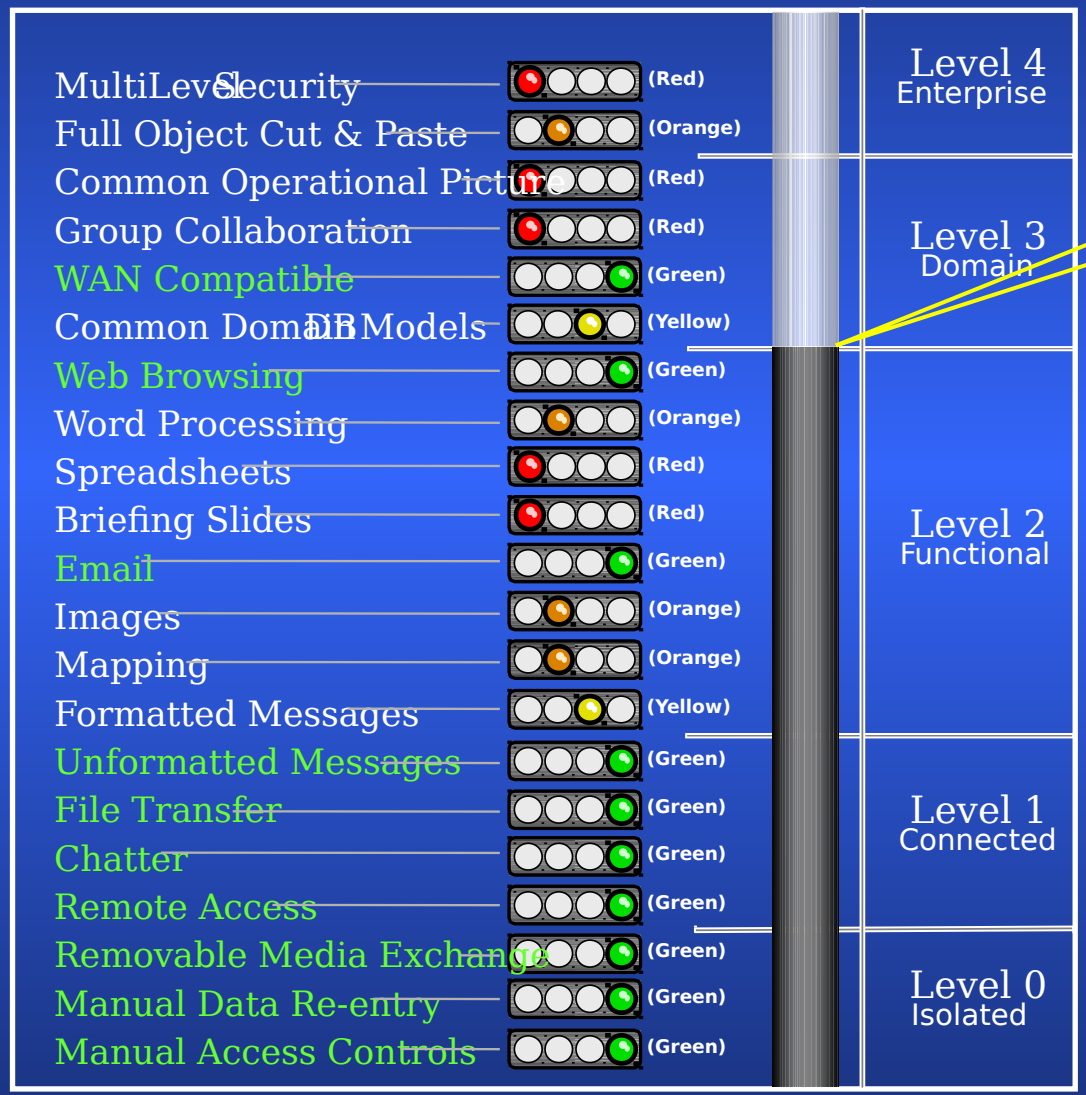
AEGIS 5.3B ← 2a → PATRIOT 2.4

AEGIS 6.3 ← 2a → PATRIOT 3.5

Each program made different implementation choices -- thus, there was no apparent increase in the level of sophistication at which PATRIOT and AEGIS could interact

Caveats: PM data in LISI has not been validated
Findings are system-specific -- operational requirements are not addressed

Composite Assessment - ASAS, GCCS-M, IAS, JDISS



Composite Interoperability Profile

LISI Level 2c

Specific Findings:

- Support for World Wide Web technology appears to be the strongest interoperability feature of the 4 systems tested. The suite of Web-based capabilities possessed by all four systems was the primary reason the composite level was achieved.
- A capability "gap" was found within the *Applications* attribute at *LISI level 2b – Basic Operations* and possible limitations within the *Data* attribute at levels 2 and below

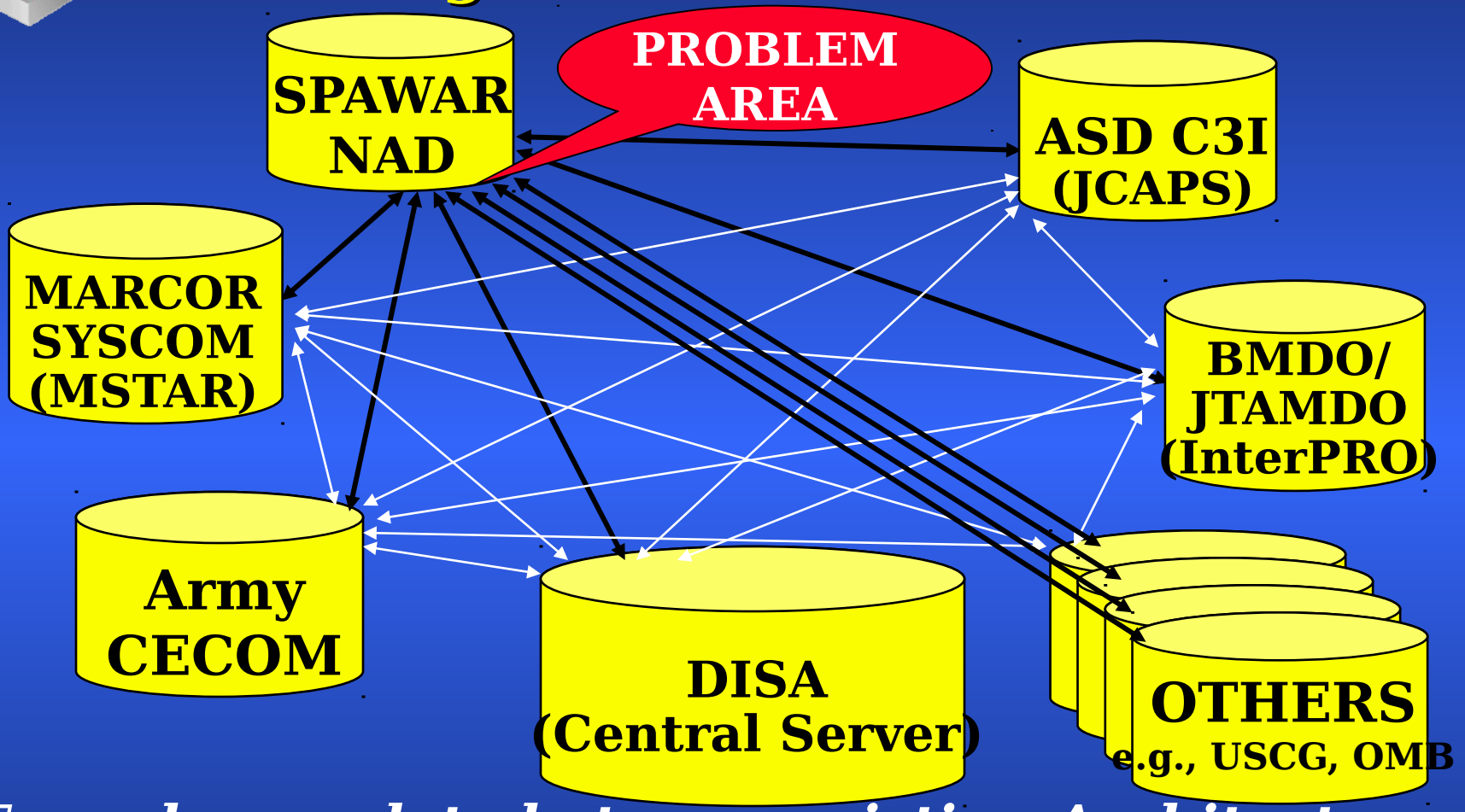
LISI Assessment of JIIB Special Interest Areas

JIIB Operational Interest Area (OIA)	LISI Question ID	Assessment	Explanation
Map Overlay Exchange – Capability to exchange threat symbology over maps including ability to pull an overlay from NIMA Map Database.	Mapping, MapFormat, MsgParser, MsgType	(Orange)	ASAS has both a Read/Write capability, IAS & JDISS have Read only capability.
MIDB Data File Exchange – Receive National/Theater level updates in IDBEXF format and exchange using IDBTF format.	MsgParser, DoDCapabilities, FileTrans, DBModel	(Orange)	Only ASAS & GCCSM show MIDB capability; LISI did not ask format detail
Imagery/Video Exchange – Receive, process, store, and exchange image and video information.	CollabServices, AVFormat, ImageFormat	(Yellow)	Capability exists for all except IAS.
	MsgParser,	(Yellow)	
		(Green)	
	at	(Green)	
		(Red)	
	Chat	(Orange)	Only IAS & GCCSM have a common Collaborative Session application. Only IAS & GCCSM have a common Chat application
Battlespace Management Information Exchange – Exchange threat track displays including accepting input from various tracking sources and identify geopositional ambiguity among these sources.	FileTrans, MapFormat, Mapping	(Orange)	Only ASAS has a full Read/Write map format capability (ADRG). IAS & JDISS have only a Read capability and GCCS-M has no capability shown at all
Collection Management Information Exchange – Exchange process AUTODIN CM messages, JCAMs 58-5 (IMINT), 58-8 (SIGINT), T+S, ESTS, NORAD (CMSS), RMS transactions, NSA ANCHORY NSRL.	SecurityStd	(Orange)	LISI currently cannot probe this area in sufficient depth and detail, however, all four systems can process CM information.
Multi-Security Level Information Exchange – Exchange material between SCI and collateral systems.	SecurityStd	(Red)	All systems can process SECRET code and data. IAS, GCCSM, JDISS can process TOP SECRET code but not data. IAS & JDISS can process US-SI/TK material.

Targeting/BDA Information Exchange -- Capability to handle formats: ACP-127, DIAM, MIIDS/IDB, GIIPS, MISREP, INTEREP, RECCEXREP & Integrated Tasking Order (ITO). Access the Master Mission Library. Support for the Mission Planning Request and support videoteleconferencing (VTC).

AUTODIN & USMTF message parsers available at all except JDISS. *(specific message data collected for IAS and GCCS-M only.)*

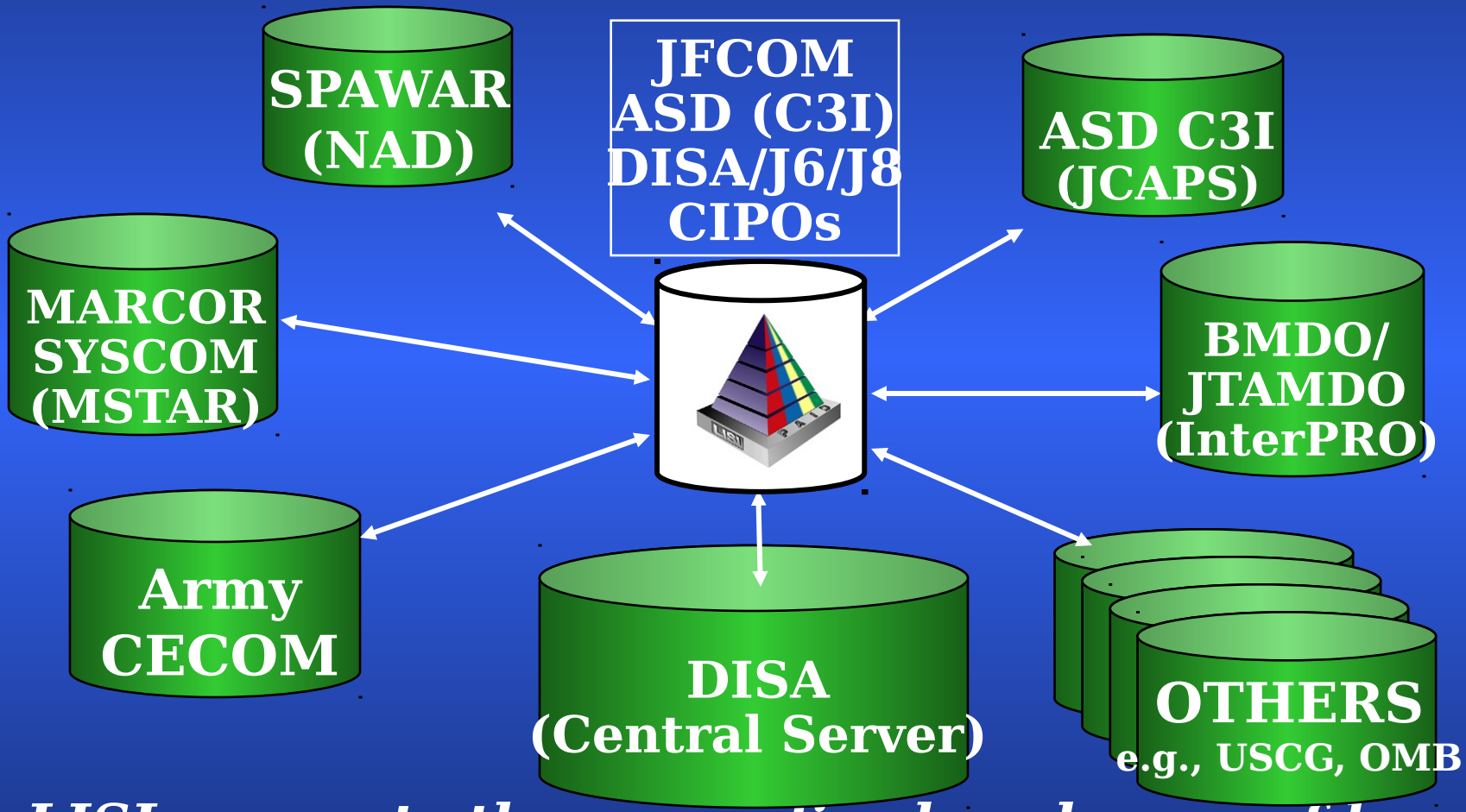
Facilitating Architecture Database Exchanges



To exchange data between existing Architecture Databases today requires a separate interface between every pair (even if CADM compliant) … OR

Near-term Integration of Architecture DBs

POTENTIAL SOLUTION



LISI supports the normalized exchange of key system information between heterogeneous architecture databases via a single interface

Improving the "tool suite" for CIPO

Exploring Synergism Opportunities

- DART (GRCI) LISI and DART teams conducted joint
  each tool to assess the potential of
  d DART to extend "message"
  ties for DoD

GRC INTERNATIONAL INC

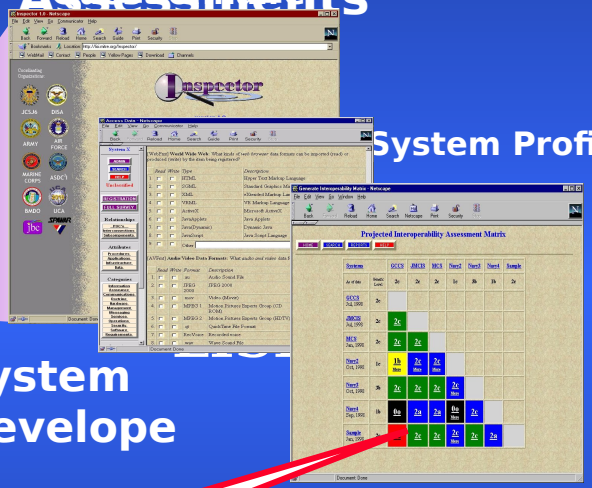
- Project Rainbow (LMCO) LISI and Rainbow teams held discussions and joint demonstrations conducted.
  of using LISI to provide system
  nent Rainbow Interoperability
  s

LOCKHEED MARTIN

Potential Relationships -- DART and Inspector

Inspector Tool-Facilitates System Registration & Capabilities Interoperability Assessments

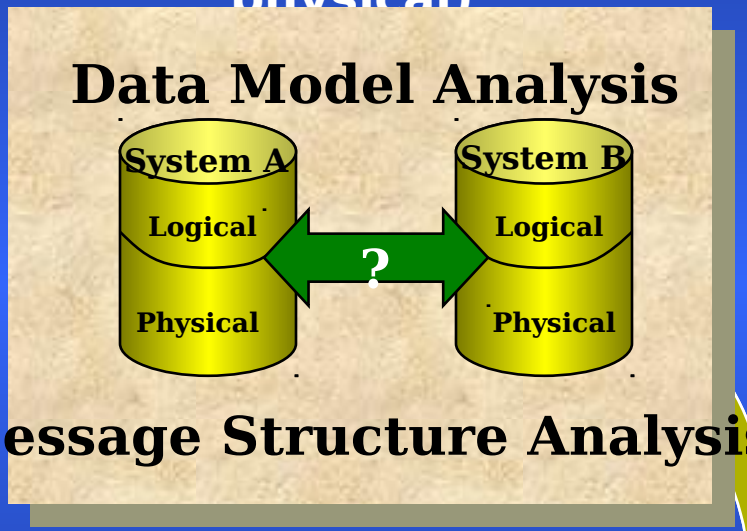
DART Tool-Facilitates Detailed Assessments of Data Structure Interoperability (logical & physical)



System Developers

Shortfall

Levels Achievable Between Systems



LISI

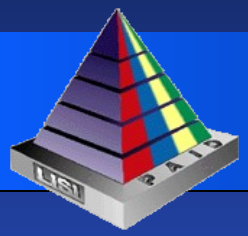
PM/Developer Entered System Technical Profiles

SYSTEM PROFILES

DATA STRUCTURE RESULTS

DART

Results of Database and Message Structure



Summary

What LISI is:

- A ***discipline*** for improving interoperability (a formal process)
- A ***work ethic*** for improving interoperability (commitment to a process)
- A ***structured approach*** for reaching agreement about what capabilities are needed to improve interoperability (how to implement a process)
- A ***measure of performance for interoperability*** that characterizes what capabilities can be performed between systems -- expressed in levels of increasing sophistication

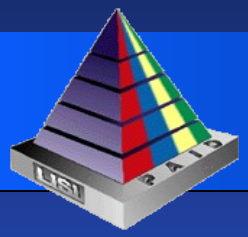
What LISI is not:

- A prescription for "guaranteeing" interoperability
- A mandated set of standards
- A process bound to technical implementations
- A directed collection of tests or procedures
- An "impossible mission"

FY99 Software Development & Deployment

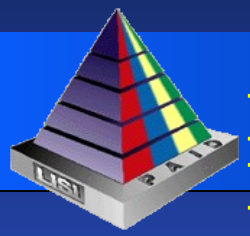
- Significant analytical work completed to "flesh" out detailed survey information -- probably the most complete analytical questionnaire within DoD. The database currently has:
  - 207 Questions
  - 2900 Options/Answers
  - 11,200 Choices/Entry points (checkboxes, radio buttons, etc.)

- Software development work completed to support distributed LISI databases and multiple questionnaires (Inspector 1.0)
  - Inspector Currently Installed at Eight Locations
    - ESC CUBE
    - MARCORSYSCOM (LOGICON Facility)
    - JBC
    - CECOM (ASEO)
    - UCAO (Lockheed-Martin Facility)
    - MITRE Washington (Presently Acting as Central Server)
    - SPAWAR 05 (version 0.2-Sep 98)
    - BMDO (TRW Facility)
  - Pending Installation at:
    - DISA (TBD--Proposed Central Server for FY00)



Inspector 1.0 -- FY99 Summary

- Provides automated support for the creation and processing of multiple IT surveys for collecting current or planned system implementation decisions by PMs/developers using a web-based interactive survey
  - LISI Survey ("PAID" based system interoperability assessments)
  - OSI Reference Model Survey (complete commercial net protocol suites)
  - DII DOE 4.0 draft Survey (Runtime specifications for version 4.0)
  - USMTF Functional Usage Survey (analysis of USMTF by functional area)
  - MARCOR MSTAR Survey (designed to collect broad architecture data)
- Questionnaire data is automatically shared between IT surveys (reduces time and effort required to complete "data calls")
- Provides data warehouse of "system" centric information that can be exploited by architecture software programs (e.g., JCAPS, InterPro, MSTAR, NAD, ...)
- Designed to facilitate dynamic exchange of data between different architecture packages (JCAPS, InterPro, MSTAR, NAD, ...)



LISI Provides all Enterprises with an Interoperability Management Tool for Cross Enterprise Analysis

- **Provides quick, Web-based (paper) assessment of interoperability**
  - Tabulates System Interoperability Profiles
  - Immediate Interoperability assessment matrix (color coded)
- **Identifies potential problem areas at the specific implementations level (Procedures, Application, Infrastructure, Data-- PAID)**
  - Immediate Benefits
    - what are the obvious gaps between systems during all stages of acquisition
    - identifies alternative (e.g. workarounds) solutions
  - Additional Future Benefits
    - what are the deviations/consequences compared with evolving prescriptive guidance
    - longer-term use of LISI will lead to a more complete set of pragmatic target solutions
- **Interoperability Assessment Matrix can be used to direct testing**
  - Allows optimum use of limited resources at the test centers (JNTF, JBC, JITC, ...)
  - Focuses attention to high-priority interoperability issues
  - Provides context for understanding test results
  - Provides an interoperability measure for CIOs performance based management
- **Provides dynamic assessments of Service/Agency/CINC architectures**
  - Critical in preparation for building JTFs
  - What if analysis (investment decisions) to overcome deficiencies

Next Steps

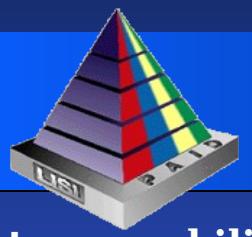
- **LISI Maturity Model & Process**
  - **Model & process complete**
  - **Capabilities model undergoing minor revisions (P attribute)**
  - **Questionnaire being drilled down for collaboration & mapping**
- **Inspector Tool**
  - **Being prepped for operational use (July target)**
  - **Debugging & human factors mods taking place**
- **CONOPS & Custodianship**
  - **Needs a champion and custodian**
  - **Current users looking for institutionalization**

LISI

A Maturity Model and Interactive Process for Assessing and Improving Interoperability

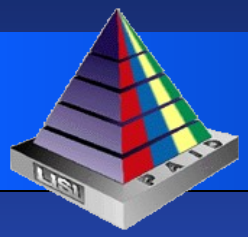
Overview

Levels of Information Systems



LISI Links to Core Business Processes, Information Products, and Mission Performance

Interoperability Maturity Levels	Business Process	Impact on Information Quality & Response					Mission
		Content	Format	Precisi	Time	Security	Targeting
4 Application Sharing & COP Manipulation	Collab-orative	Event-responsive information; scaleable perspectives; common data & shared apps	Adaptive, event-driven & scaleable views	Event-focused, correlated & collaborated; de-confliction across domains	Minutes or Seconds	Fully automated cross-domain	•Relocatable, mobile, & moving targets •Dynamic priorities •Essential Assisted Target Recognition (ATR)
3 Database Sharing & Sophisticated Collaboration		User-adapted across domains information; interactive cueing and filtering; shared data across organizations; full cut-and-paste	Adaptive, user-tailored views	Event-driven, correlated & collaborated; de-confliction across COIs		Fully automated cross-COI	•Relocatable & mobile •Some ATR •Some integrated priorities
2 Complex Exchange & Basic Collaboration	Co-operative	Mostly pre-set, multi-media products; automated cut-and-paste; some interactive filtering	Fixed multi-media views; user choices	Precision based on all-source fusion; limited de-confliction across organizations	Hours or Minutes	Firewalls Guards PKI	•No *a priori* intelligence •Stable targets •Stable priorities
1 Simple Exchange		Pre-set, single-medium products; limited capability to filter products; user extraction	Fixed, non-integrated views	Individual source-driven; non-correlated; high risk of conflicts			•Fixed targets •No *a priori* intelligence •No ATR •Limited *a priori* intelligence
0 Manual	Isolated	Pre-set, single-medium products; user extraction o needed			Weeks or Days	Man in the loop	•Fixed targets •Stable priorities •No ATR •*a priori*



Comparison with Other Maturity Models

Reference Model	Primary Thrust	Scope
IC IS Capability Maturity Roadmap DII COE Levels of Runtime Environment Compliance Levels of Information Systems Interoperability (LISI) NATO Levels of System Interconnection CIA Community of Interest (COI) Security Levels	Functional Capability	***Intelligence Community*** • Levels of Enterprise IT capability maturity • Information technology & functional capabilit
	Applications Portability	• ***DoD*** • Levels of application-to-workstation/OS portability • Segmentation, configuration control, documentation, ...
	Systems Interopera-bility	***Global*** • Levels of information-exchange sophisticatio • IS implementations (procedures, applications infrastructure, and data
	Access Control	• ***NATO member countries*** • Levels of system access • Users, systems, & connectivity/access contro
	Data Protection	***CIA*** • Levels of COI security and data protection • System/network security, access authority, protection methods